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A Study of The Fort Hays Kansas State College Placement Test

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A STUDY OF THE FORT HAYS KANSAS STATE COLLEGE PLACEMENT TESTS

being

A thesis presented to the Graduate Faculty
of the Fort Hays Kansas State College in
partial fulfillment of the requirements for
the Degree of Master of Science

by

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Fort Hays Kansas State College

Date

July 19, 1949

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CHAPTER I

INTRODUCTION

Statement of Problem

Among recent trends in education at the collegiate level is that which pertains to the use of placement tests for entering freshmen in college. Many colleges in different parts of the nation have made use of these entrance tests. Among these schools we find Fort Hays Kansas State College.

The question of the value of the use of such tests might very properly be raised. Do placement tests really fulfill their function? Should freshmen be exempted from certain basic courses if they make or exceed stipulated scores on the tests? Or should freshmen be required to take the basic courses to give them a better foundation in the various subjects? It is out of such questions as these that the basis for this study arose. Specifically stated, the problem of the thesis is to determine some of the values of the placement tests used by Fort Hays Kansas State College, and whether or not they really fulfill their function.

Definitions and Limits

Since this is a study of the tests used by Fort Hays Kansas State College in testing its entering freshmen, it is necessary that the students included in the study must have been enrolled in that institution. Four different classes of freshmen will be considered in the study. They are the classes entering Fort Hays Kansas State College in the fall semesters of the years of 1938, 1939, 1946, and 1947. These classes were selected for the following reasons: First, the years of 1946 and 1947 were selected because these were the first two years of the present system used by Fort Hays State in testing entering freshmen; second, the years of 1946 and 1947 were selected because it was desired to examine the scholastic record of students who entered under the present plan, but who had also attended college at least four semesters; third, the years of 1938 and 1939 were selected because it was necessary to examine the scholastic record of two classes of normal pre-war students whose first two years of college study were not disrupted by the war, thus eliminating to a certain degree the chance of error due to the existence of abnormal conditions of enrollment.

Related Research

During the past years various studies have been made in which the scholastic success of students has been examined. Among such studies is a study by Agnew K. Van Tine, who, as a result of his study in 1940 in which he used the Thurstone records of all students,

the high school graduating rank in percentile for all students, the estimate of the high school principals for all students, and a mathematics classifying examination for engineers, concluded the following: (1) College success can be predicted with a fair degree of accuracy by using high school records and psychological examinations as a basis for prediction. (2) Critical scores could be determined in the various measures below which a student had very little, if any, chance of survival. (3) Although no student who rated low on all the measures passed, a number who rated high on the same measures, failed to survive, indicating that there are other factors involved in college success than those investigated in his study.¹

Edgar Reed, in a study of the relative achievement of pupils in class A, class B, and class C high schools, found that in "Comparing the college grade points made by the students in the survey no significant reliable differences occur in favor of any one class."² He also states:

If one wishes to consider probabilities the conclusion concerning them would be, students from class C

1. Agnew K. Van Tine, The Prognostic Value of Entrance Tests and Requirements at the Drexel Institute of Technology. Master's Thesis, Temple University, 1940, p. 67.

2. Edgar Reed, A Study of the Relative Achievement of Pupils in Class A, Class B, and Class C High Schools in the State of Kansas. Master's Thesis, Fort Hays Kansas State College, Hays, Kansas, 1937. 48 pp.

high schools rank first in college achievement, students from the class B high schools rank second in college achievement, and the students from the class A high schools rank third in college achievement.³

Reed concluded that too much stress has been made about the differences between class A, B, and C high schools, and voiced the opinion, on the basis of his study, that if differences did exist, they were not in the mastery of subject matter.⁴

These conclusions reached by Edgar Reed seem to indicate that certainly some other basis than the class of high school from which the student came should be used as an exempting factor. A point in favor of using the placement test as a basis for exemption seems to be indicated in the study by Floyd Reed in which he found that " . . . it is the individual and not the school that plays the major role in the determination of results."⁵ If the preceding statement is sound or valid, the task would seem to be to devise tests which would accurately measure the accomplishments of each individual student.

Method

The tests used at Fort Hays Kansas State College in the fall of 1946 and 1947 for freshmen placement and guidance purposes were the

3. Ibid., p. 46.

4. Ibid., p. 47.

5. Floyd L. Reed, The Comparative Achievement of Entering College Freshmen Based on Standardized Tests and Semester Grade Point. Master's Thesis, Fort Hays Kansas State College, Hays, Kansas, 1947, p. 73.

following: The Barrett-Ryan English Test, form III; the Kansas Mathematics Test Number Four; the American Council on Education Cooperative Biology Test, revised series, form P; a modern civilization history test prepared by the Fort Hays Kansas State College History Staff; a physical science test prepared by the Fort Hays Kansas State College Physics Staff; and the Henmon-Nelson Tests of Mental Ability, form A. These tests were administered by staff members of the Fort Hays Kansas State College. They were given on the college campus, and were scored by the college staff members and their student assistants.

In this study a comparison will be made of the scholastic success of three groups of students. The first group will be the students in the classes of 1938 and 1939. The second group will be the students in the classes of 1946 and 1947 who were exempted from the basic courses. The third group of students will be those of the 1946 and 1947 classes who were required to take the basic courses. After the data concerning the scholastic success of the above groups was assembled, comparisons were made from which conclusions were drawn.

CHAPTER II

BASES OF COMPARISON

Data Background

In order that the reader may maintain a clear understanding of the comparisons which will be made later in the chapter, it is best that a resume be given of the background materials from which the comparisons were made. This will be done by explaining the background materials of each group individually.

Three hundred thirty-four students took the entrance examinations in the fall of 1947. Of these, 171, at the time of this survey, had completed less than four semesters of college work by the end of the spring semester, 1949. Also, of those taking the entrance examinations in the fall of 1947 and classified as freshmen, thirty-two were not applicable to this study because they had gained college credit prior to the fall of 1947 either at Fort Hays Kansas State College or at another institution. This leaves a total of 131 students of this group applicable to this study. By being applicable to this study is meant that the student entered college for the first time and at Fort Hays Kansas State College in the fall of the years of either 1938, 1939, 1946, or 1947; and further, the student must have completed four semesters of college by the end of the spring semester, 1949.

By examining Table I it may be seen that of the total of 334

students who took the entrance examinations in the fall of 1947, 13 students were exempted from English 1, 239 from Basic Mathematics 1, 33 from Biology 1, 38 from Physical Science 1, and 21 from Modern Civilization 4. Since only 131 students of the total 334 were applicable to the study, it may readily be assumed that some of the exempted students did not survive their first four semesters of college. Of the 131 students applicable to the survey, 125 took additional work in the field of English. Of these, nine were exempted students and 116 were non-exempted students. Twenty-six students took additional courses in the field of mathematics. Of these, twenty-four were exempted students and two were non-exempted students. Of the exempted mathematics students, only two took Basic Mathematics 1. Thirty-one students took additional courses in the field of biology or the related fields of botany or zoology. Of these four were exempted and twenty-seven were non-exempted students. None of the four exempted students took Biology 1. Eight students took additional courses in the field of physics. Of these, four were exempted and four were non-exempted students. None of the exempted students took Physical Science 1. Twenty-seven students took additional courses in the field of history. Of these, three were exempted and twenty-four were non-exempted students. All of the exempted students took Modern Civilization 4.

Four hundred sixty-seven freshmen took the entrance examinations in the fall of 1946. Of these, 251 had not completed four semesters of college by the end of the spring semester, 1949. Forty-

TABLE I. STUDENTS EXEMPTED BY THE RESULTS OF THE ENTRANCE TESTS
GIVEN IN 1946 and 1947

Subject From Which Exempt	Class of 1946	Class of 1947	Total
Eng. Comp. 1	Unknown	13	13
Basic Math. 1	321	239	560
Biology 1	37	33	70
Phy. Sci. 1	96	38	134
Mod. Civ. 4	50	21	71

one were not applicable to the study because they had gained college credit either at Fort Hays or some other institution prior to the fall of 1946. This leaves 175 students of this group applicable to the study.

As shown in Table I, of the total of 467 who took the entrance examinations in the fall of 1946, 321 were exempted from Basic Mathematics 1., 37 from Biology 1, 96 from Physical Science 1, and 50 from Modern Civilization 4. Statistics giving the number exempted

from English Composition 1 were not available.

Of those applicable in the 1946 group, 172 took additional courses in the field of English. Seventy-five of the 1946 group took additional courses in the field of mathematics. Of these, fifty-eight were exempted and seventeen non-exempted students. Of the exempted students, seven took Basic Mathematics 1. Fifty-nine of the 1946 group took additional courses in the field of biology or the related fields of botany or zoology. Of these, six were exempted and fifty-three were not exempted from Biology 1. Only one of the exempted students took Biology 1. Thirty-four of the 1946 group took additional courses in the field of physics. Of these, thirteen were exempted and twenty-one were non-exempted students. None of the exempted students took Physical Science 1. Thirty-nine of the 1946 group took additional courses in the field of history. Of these, four were exempted and thirty-five were non-exempted students. Three of the four exempted students took Modern Civilization 4.

Three hundred eighty-nine students were classified as entering freshmen in the fall of 1939. Of these, 209 had completed less than four semesters of college by the end of the spring semester, 1949. This leaves 180 students applicable to the study.

Of the 1939 group applicable to this study, 178 took additional courses in the field of English. Of these, 176 took English Composition 1. Seventy-eight of the 1939 group took additional courses in the field of mathematics. Basic Mathematics 1 was not

offered in the fall of 1939, it first being offered in the fall of 1943. Sixty-three of the 1939 group took additional courses in the field of biology or the related fields of botany or zoology. Of these, twenty-one took Biology 1 and forty-two did not. Fifty-three of the 1939 group took additional courses in the field of physics. Of these two took Physical Science 1 and fifty did not. Ninety-four of the 1939 group took additional courses in the field of history. Of these, forty-six took Modern Civilization 4 and forty-eight did not.

Three hundred ninety students were classified as entering freshmen in the fall of 1938. Of these, 226 had completed less than four semesters of college by the end of the spring semester, 1949. This leaves a total of 164 students of this group applicable to this study.

One hundred sixty of the 1938 group took additional courses in the field of English. Of these, 159 took English 1. Seventy-eight of the 1938 group took additional courses in the field of mathematics. The course, Basic Mathematics 1, also was not offered in the fall of 1938. Seventy-two of the 1938 group took additional courses in the field of biology or the related fields of botany or zoology. Of these, thirty-one took Biology 1 and forty-one did not. Thirty-seven of the 1938 group took additional courses in the field of physics. Of these, three took Physical Science 1, and thirty-four did not take Physical Science 1. Eighty-two of the 1938 group took additional courses in history. Of these, forty-two took Modern Civilization 4 and forty did not.

Comparisons of the Various Groups

This part of the chapter is concerned with the various comparisons of the groups applicable to this study. In making these comparisons various statistical measures will be used. Among these are the mean, sigma or the standard deviation of the mean, the standard error of the mean, the difference of means, the standard error of the difference of means, the ratio of the difference of the means to the standard error of the difference of the means, and the chances in 100 that an obtained difference is significant. In succeeding pages the mean will sometimes be referred to as M , sigma as σ , the standard error of the mean as σ_M , the difference of means as D , the ratio of the difference of means to the standard error of the difference of the means as D/σ_M .

In cases of comparisons, after the ratio of the difference of the means to the standard error or the difference was found, Garrett's table¹ was consulted to find the chances in 100 that a difference was significant. Regarding the question of significant differences, Garrett makes the following statement:

It is customary to take a D/σ_M of 3 as indicative of a significant difference (virtual certainty) since there is only about 1 chance in 1000 that a difference of -3σ will arise when the true difference is zero.²

1. Henry E. Garrett, Statistics in Psychology and Education. (New York: Longmans Green and Co., 1926), p. 213.

2. Loc. cit.

The comparisons in this study are based on the scholastic grade points of the students as obtained from the records in the office of the registrar of Fort Hays Kansas State College. The grade points of the students for the subject fields did not include the grades made in the basic course. This policy was followed for the specific purpose of defeating the possibility that students failed to do well in a course because they were required to take the course. Of course an exception to this will occur in the field of English in which students were required to take more than one course; however, since those exempted from English Composition 1 were still required to take other English courses, it is believed the results are reliable.

The first comparison will be that of the over-all scholastic achievement of the four groups included in this study. This comparison is shown in Table II. In Table II it is shown that the 1939 group had the highest mean, 1.54, followed in turn by the 1947, 1938, and 1946 groups with means of 1.44, 1.40, and 1.39 respectively. When the 1947 and 1946 groups, which took the placement tests, were combined and their achievement compared with the combined groups of 1938 and 1939, it was found that the 1938-1939 group had a mean of 1.47 compared with the mean of 1.41 for the 1946-47 group. In order to determine whether the difference of these two combined groups was significant, the ratio of the difference of the means, .06, to the standard error of the difference of the means, .04, was computed. This was found to be .14. This indicates that there are 56 chances in 100 that the difference is significant and in favor of the 1938-

TABLE II. SCHOLASTIC ACHIEVEMENT OF THE FOUR YEAR-GROUPS INCLUDED IN THE STUDY

Group	Cases	Mean	Sigma	σ_M	D_M	σ_D	$\frac{D}{\sigma_D}$	Chances in 100	In Favor of
1947	131	1.44	.55	.048					
1946	175	1.39	.60	.045					
1939	180	1.54	.55	.041					
1938	164	1.40	.51	.040					
1946-1947	306	1.41	.58	.033	.06	.44	.14	56	1938-1939
1938-1939	344	1.47	.53	.029					

TABLE III. SCHOLASTIC ACHIEVEMENT OF EXEMPTED STUDENTS

Group	Cases	Mean	Sigma	σ_M
1947 Group - English	9	2.23	.49	.163
1947 Group - Math.	24	1.39	.83	.170
1946 Group - Math.	58	1.39	.84	.111
1946-47 Group - Math.	82	1.39	.83	.092
1946-47 Group - Biology	10	1.69	.82	.259
1946 Group - Physics	13	1.63	.85	.235
1946-47 Group - Physics	17	1.61	.86	.209

1939 group. This is indicative of but a slight superiority, if any, of the 1938-1939 group over the 1946-1947 group.

In Table III is presented the scholastic achievement of exempted students. This achievement is based on the grades made in the additional courses taken in the specified field. By examining the table it is seen that the smaller the subject group, in this case, the higher is the mean. In the mathematics group a high degree of homogeneity of groups is indicated by the fact that the means for the 1947 group, the 1946 group, and the 1946-1947 group, are all

the same.

The means for the 1946 group and the 1946-1947 group in physics is nearly the same, indicating the possibility of a high degree of homogeneity between the two groups. Unfortunately an insufficient number of exempted students of the 1947 group had taken additional courses in the physics field to warrant an attempt to make a comparison between the 1947 group and the 1946 group. The same difficulty applies to the biology and history groups. The list of exempted students for the 1946 English group was not available.

In Table IV is presented the scholastic achievement of students required to take the basic courses. This achievement is also based on grade points earned in the specific fields in which additional courses were taken. The means of the various groups in this table do not vary much within the subject fields. In general the means are lower than the means of the exempted groups. Comparisons will be made between these groups and the exempted groups at a later point in the study.

In Table V is presented the scholastic achievement of the students who did not take the placement tests. These are the 1938 and 1939 groups. The achievement for these groups also is based on the grade points made in the courses taken in the specified subject fields. One interesting aspect of these groups is that the mean for the 1938 biology group which took Biology 1 is lower than the mean of the 1938 biology group which did not take Biology 1. On the other hand, the 1938 and the 1939 groups which took Modern Civilization 4 had considerably higher means than their comparative

TABLE IV. SCHOLASTIC ACHIEVEMENT OF STUDENTS REQUIRED TO TAKE
BASIC COURSES

Group	Cases	Mean	Sigma	σ_M
1947 Group - English	116	1.29	.72	.066
1946 Group - English	172	1.26	.68	.052
1946-47 Group - English	287	1.27	.70	.041
1946 Group - Math.	17	1.00	.60	.146
1946-47 Group - Math.	19	.99	.59	.136
1947 Group - Biology	27	1.26	.77	.148
1946 Group - Biology	51	1.28	.79	.111
1946-47 Group - Biology	78	1.27	.79	.089
1946 Group - Physics	16	.92	.61	.153
1946-47 Group - Physics	18	.97	.62	.146
1947 Group - History	22	1.23	.72	.154
1946 Group - History	33	1.23	.66	.115
1946-47 Group - History	55	1.23	.69	.092

TABLE V. SCHOLASTIC ACHIEVEMENT OF STUDENTS WHO DID NOT TAKE
THE PLACEMENT TESTS

Group	Cases	Mean	Sigma	σ_M
1939 - English (All)	178	1.48	.67	.050
1939 - English (Took Eng. Comp. 1)	176	1.47	.66	.050
1938 - English (All)	160	1.35	.65	.107
1938 - English (Took Eng. Comp. 1)	159	1.36	.65	.108
1938-39 - English (Took Eng. Comp. 1)	335	1.42	.66	.036
1938-39 - English (All)	338	1.42	.66	.036
1939 - Math.	78	1.53	.86	.097
1938 - Math.	68	1.43	.71	.864
1938-39 - Math.	146	1.48	.79	.066
1939 - Biology (All)	63	1.75	.87	.109
1939 - Biology (Took Biology 1)	21	1.78	.81	.177
1939 - Biology (Did not take Biology 1)	42	1.74	.87	.109

TABLE V. (Continued) SCHOLASTIC ACHIEVEMENT OF STUDENTS WHO DID NOT TAKE THE PLACEMENT TESTS

Group	Cases	Mean	Sigma	σ_M
1938 - Biology (All)	72	1.34	.80	.094
1938 - Biology (Took Biology 1)	31	1.10	.68	.122
1938 - Biology (Did not take Biology 1)	41	1.49	.73	.113
1938-39 - Biology (All)	135	1.50	.89	.077
1938-39 - Biology (Took Biology 1)	52	1.37	.85	.120
1938-39 - Biology (Did not take Biology 1)	83	1.62	.88	.097
1939 - Physics (All)	53	1.57	.73	.101
1939 - Physics (Did not take Phy. Sci. 1)	50	1.59	.71	.108
1938 - Physics (All)	37	1.56	.77	.127
1938 - Physics (Did not take Phy. Sci. 1)	34	1.57	.80	.138
1938-39 - Physics (All)	90	1.56	.77	.081
1938-39 - Physics (Did not take Phy. Sci. 1)	84	1.58	.75	.028

TABLE V. (Continued) SCHOLASTIC ACHIEVEMENT OF STUDENTS WHO DID NOT TAKE THE PLACEMENT TESTS

Group	Cases	Mean	Sigma	σ_M
1939 - History (All)	94	1.28	.77	.079
1939 - History (Did not take Mod. Civ. 4)	48	1.06	.71	.103
1939 - History (Took Mod. Civ. 4)	46	1.52	.79	.117
1938 - History (All)	82	1.14	.72	.079
1938 - History (Did not take Mod. Civ. 4)	40	1.02	.59	.094
1938 - History (Took Mod. Civ. 4)	42	1.23	.80	.123
1938-39 - History (All)	176	1.21	.76	.057
1938-39 - History (Did not take Mod. Civ. 4)	88	1.04	.66	.070
1938-39 - History (Took Mod. Civ. 4)	88	1.38	.81	.084

I-B Capitalization

DIRECTIONS: Make a plus sign in the parenthesis before each sentence in which the capital letters are correctly used, as in "A" below. Make a minus sign in the parenthesis before each sentence that has in it a capital letter where a small letter should be used, as in "B" below, or a small letter where a capital should be used, as in "C" below.

Examples: A. (+) I saw Ben enter the store.
B. (—) I Saw Ben enter the store.
C. (—) i saw Ben enter the store.

31. () The students of Forest College are expected to read a passage from the Bible every day.
32. () I liked Professor Brown better than any other professor in the college.
33. () Poe wrote the story, "The Fall of the House of Usher."
34. () Many indians and negroes took part in the pageant.
35. () All of Mrs. Brown's sons came home for Thanksgiving Day.
36. () Last Spring we had heavy rains.
37. () Dorothy attended the Chase County High School for four years.
38. () "If I had been there," he said, "This would not have happened."
39. () John Jones was elected President of his class.
40. () My sister has enjoyed studying history and English.

II-A Sentence Structure and Diction

DIRECTIONS: In each of the following sentences a word or a group of words is enclosed in brackets. If this word or word group is correctly used in the sentence, make a plus sign in the parenthesis before the sentence, as in "A" below. If the word or word group is incorrect or is wrongly placed, make a minus sign in the parenthesis, as in "B" below.

Examples: A. (+) You surely [heard] what the speaker said.
B. (—) I [ain't] going to school today.

41. () We saw [most] all the games that our school played.
42. () Both of Ben's sisters are [light-complected].
43. () Lillian [had ought] to have answered when her name was called.
44. () The murderer was [hanged] Saturday.

45. () Mr. Green was a man whom we trusted fully, [and who] proved himself to be worthy of being trusted.
46. () No coach can [learn] him to play the game.
47. () May and Nora went home last night all by [themselves].
48. () A [saleswoman] came to me and asked if I wished something.
49. () The fog was so thick that we [could hardly] see across the street.
50. () I do not have [more than] two lessons to get for tomorrow.
51. () His message, [which] came too late, had been delayed by the storm.
52. () The man standing nearest the counter is the [party] we want.
53. () I went back to my seat and [set] down to wait for the bell.
54. () [After writing] the theme, it was laid on the desk.
55. () [Being delayed] by a late dinner, it was too late for us to go to the first show.
56. () My brother [being] with me, I felt safer.
57. () The child [irritated] me with many questions.
58. () The lamp [sits] on the table near the door.
59. () Philip's [being absent] more than half of the time prevented him from getting a grade in the course.
60. () The [effect] of his words was good.
61. () John looked up every fact to which there was an [allusion] in the essay.
62. () His writing was poorer than [an average third-grade pupil].
63. () I cannot find your book [anywheres].
64. () We had [all ready] finished the work when he came.
65. () The mail carrier fell off [of] his horse.
66. () You boys [ought not] to have done that.
67. () It seems [like] I ought to know you.
68. () The [taller] of the twins was here today.
69. () [May] I borrow your pen for a few minutes, please?
70. () Mr. Jackson sold all of his wheat before the price had [raised].

groups which did not take Modern Civilization 4. The reliability of the difference of the means of these groups will be determined at a later point.

Tables VI, VII, VIII, IX, and X will present the scholastic achievement of the various groups from another standpoint, that of the various subject fields. In these tables the chances in 100 of a significant difference between means will be computed for different combinations. Table VI, showing comparisons of the English groups, will be considered first. The table shows that there are 80 chances in 100 that the 1947 English group as a whole is superior to those who were not exempted as a result of taking the placement tests. Also, the exempted students of the 1947 group show a great superiority over the nonexempted students, having a difference in means of 1.04 and their chances in 100 being 100, or virtual certainty, that the average student of the 1947 exempt group will always be superior to the average non-exempted student of the 1947 group. The 1947 exempt group also indicated by their D/σ_D that they had 100 chances in 100 of being superior to the combined non-exempt 1946 and 1947 groups.

An indication of homogeneity of the 1938 and 1939 English groups was indicated by their chances in 100 of a significant difference. The results show that there were 61 chances in 100 in favor of the total 1939 English group over the 1939 English group which took English Composition 1; 53 chances in 100 in favor of the 1938 English group which took English Composition 1 over the total 1938 English group; and there were 52 chances in 100 in favor of the

TABLE VI. COMPARISON OF STUDENTS WHO TOOK ADDITIONAL COURSES IN ENGLISH

Group	Cases	Mean	Sigma	σ_M	D_M	σ_D	$\frac{D}{\sigma_D}$	Chances in 100	In Favor Of
1947 - Eng. (All)	125	1.37	.75	.067					
1947 - Eng. (Non-Exempt)	116	1.29	.72	.066	.08	.094	.85	80	All
1947 - Eng. (Exempt)	9	2.33	.49	.163	1.04	.176	5.91	100	Exempt
1946-47 Eng. (Non-Exempt)	288	1.27	.70	.041	1.06	.168	6.31	100	Exempt
1939 - Eng. (All)	178	1.48	.67	.050					
1939-Eng. (Took Eng. 1)	176	1.47	.66	.050	.02	.071	.28	61	All
1938 -Eng. (All)	160	1.35	.65	.107					
1938 - Eng. (Took Eng.1)	159	1.38	.65	.108	.01	.152	.07	53	Took Eng.1
1938-39 - Eng. (All)	338	1.42	.66	.036					
1938-39 - Eng. (Took Eng.1)	335	1.42	.66	.036	.00 $\frac{1}{4}$.051	.05	52	All

1938-39 total combined group over the 1938-39 group which took English Composition 1. Since 50 chances in 100 is considered to be pure chance, it can be seen that these differences are not at all reliable and no conclusions can be drawn from them. The homogeneity of these groups was without a doubt influenced to a great extent by the small number of cases not taking English Composition 1.

Comparisons of the groups who took additional courses in mathematics are shown in Table VII. As shown by this table, the difference of the means of the 1947 mathematics group as a whole and the 1947 exempted group is but .03. The D/σ_D is but .12, which indicates that there are but 54 chances in 100 that the difference is real, barely more than chance.

The non-exempted mathematics group of the 1946 class has a mean of 1.00 compared with the mean of 1.39 of the exempted group. The difference of their means is .39, the σ_D is .183, and the D/σ_D is 2.13. This indicates that there are 98 chances in 100 that the difference is real and in favor of the exempted group. This indicates a trend toward significance.

The comparison in Table VII of the 1946-47 non-exempted mathematics group and the 1946-47 exempted group shows even a greater tendency toward significance in favor of the exempted group. As indicated in the table the mean difference is .40, the standard error of the difference is .164, and the D/σ_D is 2.44. This indicates that there are 99.3 chances in 100 that the difference is real and that the exempted group is superior to the non-exempted

TABLE VII. COMPARISON OF STUDENTS WHO TOOK ADDITIONAL COURSES IN MATHEMATICS

Group	Cases	Mean	Sigma	σ_M	D_M	σ_D	$\frac{D}{\sigma_D}$	Chances in 100	In Favor Of
1947 - Math. (All)	26	1.36	.99	.195	.03	.259	.12	54	Exempt
1947 - Math. (Exempt)	24	1.39	.83	.170					
1946 - Math. (Non-Exempt)	17	1.00	.60	.146	.39	.183	2.13	98	Exempt
1946 - Math. (Exempt)	58	1.39	.84	.111					
1946-47 - Math. (Non-Exempt)	19	.99	.59	.136	.40	.164	2.44	99	Exempt
1946-47 - Math. (Exempt)	82	1.39	.83	.092					

group.

Table VIII indicates the comparisons made of the biology groups. The first comparison is between the total 1947 biology group and the 1947 non-exempted biology group. The total group has a higher mean by a difference of .05. The standard error of the difference is .202 and the D/σ_D is .50. This indicates that there are 69 chances in 100 that the difference in favor of the total group is real. This reliability is weak; however, if the difference is real, it may be assumed that the difference was caused by the four exempted students who were included in the total group. Thus, if the foregoing statements are true, then the exempted group is superior to the non-exempted group.

The comparison of the total 1946 biology group with the 1946 non-exempted biology group gives practically no indication that the difference is real, for in this case there are but 53 chances in 100 that the difference is real. When compared with pure chance, 50 in 100, it may be seen that the obtained difference can be given but little consideration.

The comparison of the 1946-47 exempted biology group with the 1946-47 non-exempted group indicates that the exempted group is superior to the non-exempted group. The difference between their mean is .38, the standard error of the difference is .275, the D/σ_D is 1.38, and the chances are 92 in 100 that the difference of the means is real. While this is not significant, it is indicative of a trend toward significance.

In comparing the 1939 Biology group which took Biology 1 with the 1939 Biology group which did not take Biology 1, it was found that there was little difference between the two groups. The group which took Biology 1 showed a slight superiority, having 57 chances in 100 that it was superior to the other group. The advantage, however, was little better than pure chance.

The 1938 biology group which took Biology 1 has a mean of 1.10 while those who did not take Biology 1 have a mean of 1.49. This gives us a difference of means of .39, a standard error of the difference of .116, a D/σ_D of 2.35, and 99.1 chances in 100 of a true difference of means. This indicates a strong tendency toward significance in favor of the group which did not take Biology 1.

When a comparison was made between the 1938-39 biology group which took Biology 1 and the 1938-39 biology group which did not take Biology 1, it was found that the difference in means was .25, the standard error of the difference was .154, the D/σ_D was 1.62, and there were 94 chances in 100 that the difference was real. This indicates a strong trend toward significance.

Table IX shows the comparisons made of the physics groups. It is indicated by the comparison between the 1946 exempted physics group and the 1946 non-exempted physics group that the chances in 100 are in favor of the exempted group. The difference in means is .78, the standard error of the difference is .307, and the D/σ_D is 2.54. This makes 99.4 chances out of 100 that a real difference exists. While this is not significant, it is highly indicative of

TABLE VIII. COMPARISON OF STUDENTS WHO TOOK ADDITIONAL COURSES IN BIOLOGY

Group	Cases	Mean	Sigma	σ_M	D_M	σ_M	$\frac{D}{\sigma_D}$	Chances in 100	In Favor of
1947 - (Non-Exempt)	27	1.26	.77	.148	.05	.202	.50	69	All
1947 -(All)	31	1.31	.77	.138					
1946 - (Non-Exempt)	53	1.34	.73	.099	.01	.147	.17	53	Non- Exempt
1946 - (All)	59	1.33	.84	.109					
1946-47 - (Non-Exempt)	80	1.31	.81	.093	.38	.275	1.38	92	Exempt
1946-47 - (Exempt)	10	1.69	.82	.259					
1939 - (Took Bio. 1)	21	1.78	.81	.177	.04	.223	.18	57	Took Bio. 1
1939 - (Didn't take Bio. 1)	42	1.74	.87	.135					

TABLE VIII. (Continued) COMPARISON OF STUDENTS WHO TOOK ADDITIONAL COURSES IN BIOLOGY

Group	Cases	Mean	Sigma	σ_M	D_M	σ_D	$\frac{D}{\sigma_D}$	Chances in 100	In Favor of
1938 - (Took Biology 1)	31	1.10	.68	.122	.39	.166	2.35	99.1	Didn't Take Bio. 1
1938 - (Didn't take Bio.1)	41	1.49	.73	.113					
1938-39 - (Took Bio. 1)	52	1.37	.85	.120	.25	.154	1.62	94	Didn't Take Bio. 1
1938-39 - (Didn't take Bio. 1)	83	1.62	.88	.097					

a trend toward significance.

The comparisons of the 1938 and 1939 physics groups may be discussed as a whole. As may be seen in Table IX, no difference of means is more than .02. Also, the chances in 100 of a real difference existing are very low, being 55, 52, and 57 chances in 100, respectively, for the three groups compared. The groups not taking Physical Science 1 were favored each time. The results, however, were little better than pure chance and should not be considered as being significant in any way other than perhaps suggesting that the two groups were quite homogeneous.

Table X portrays the comparisons of the history groups. None of the 1946 and 1947 groups which were compared with each other indicated a strong tendency toward significance. The chances in 100 for the three groups compared were 60, 69, and 70, respectively. These indicate but slight tendencies toward significance. It should be noticed, however, that the tendency was in favor of the group, each time, which contained exempted students.

By comparing the 1939 history group which took Modern Civilization 4 with the 1939 history group which did not take Modern Civilization 4, it was found that the difference of the means is .46, the standard error of the difference is .158, the D/σ_D is 2.91, and the chances are 99.8 in 100 that the difference is significant and not due to chance. This is highly indicative of a tendency toward significance. This tendency is in favor of the group which took Modern Civilization 4.

In the comparison of the 1938 history group which took Modern Civilization 4 with the 1938 history group which did not take Modern

TABLE IX. COMPARISON OF STUDENTS WHO TOOK ADDITIONAL COURSES IN PHYSICS

Group	Cases	Mean	Sigma	σ_M	D_M	σ_D	$\frac{D}{\sigma_D}$	Chances in 100	In Favor Of
1946 - (Non-Exempt)	21	.86	.91	.198	.78	.307	2.54	99.4	Exempt
1946 - (Exempt)	13	1.64	.85	.235					
1946-47 - (Non-Exempt)	25	.96	.74	.149	.65	.257	2.53	99.4	Exempt
1946-47 - (Exempt)	17	1.61	.86	.209					
1939 - (All)	53	1.57	.73	.101	.02	.151	.13	55	Didn't Take Phy. Sci. 1
1939 - (Didn't take Phy. Sci. 1)	50	1.69	.71	.108					
1938 - (All)	37	1.56	.77	.127	.01	.187	.05	52	Didn't Take Phy. Sci. 1
1938 - (Didn't take Phy. Sci. 1)	34	1.57	.80	.138					
1938-39 - (All)	90	1.56	.77	.081	.02	.115	.17	57	Didn't Take Phy. Sci. 1
1938-39 - (Didn't take Phy. Sci. 1)	84	1.58	.75	.082					

TABLE X. COMPARISON OF STUDENTS WHO TOOK ADDITIONAL COURSES IN HISTORY

Group	Cases	Mean	Sigma	σ_M	D_M	σ_D	$\frac{D}{\sigma_D}$	Chances in 100	In Favor Of
1947 -(All)	27	1.29	.71	.136	.05	.198	.25	60	All
1947 - (Non-Exempt)	24	1.24	.71	.144					
1946 - (All)	39	1.30	.79	.126	.09	.175	.51	69	All
1946 - (Non-Exempt)	35	1.39	.72	.122					
1946-47 - (All)	66	1.30	.76	.039	.06	.113	.53	70	All
1946-47 - (Non-Exempt)	59	1.24	.72	.064					
1939 - (Took Mod. Civ. 4)	46	1.52	.79	.117	.46	.158	2.91	99.8	Took Mod. Civ. 4
1939 - (Didn't take Mod Civ. 4)	48	1.06	.71	.103					

TABLE X. (Continued) COMPARISON OF STUDENTS WHO TOOK ADDITIONAL COURSES IN HISTORY

Group	Cases	Mean	Sigma	σ_M	D_M	σ_D	$\frac{D}{\sigma_D}$	Chances in 100	In Favor of
1938-(Took Mod. Civ.4)	42	1.23	.80	.123	.21	.155	1.35	91	Took Mod. Civ. 4
1938 -(Didn't take Mod. Civ. 4)	40	1.02	.59	.094					
1938-39 - (Took Mod. Civ.4)	88	1.38	.81	.084	.34	.110	3.09	100	Took Mod.Civ. 4
1938-39- (Didn't take Mod. Civ. 4)	88	1.04	.66	.070					

Civilization 4 it was found that the difference of the means was .19, the standard error of the difference being .142, the D/σ_D being 1.34, and the chances were 91 in 100 that those who took Modern Civilization 4 were superior to the group which did not take Modern Civilization 4.

In the comparison of the 1938-39 history group which took Modern Civilization 4 with the 1938-39 group with the 1938-39 group which did not take Modern Civilization 4, it was found that the difference in means was .34, the standard error of the difference was .110, the D/σ_D was 3.09, that the chances were 100 in 100 that the difference was real. The difference was in favor of the group which took Modern Civilization 4. The result of this comparison is significant for a D/σ_D of 3.00 is considered significant (virtual certainty) and in this case a D/σ_D of 3.09 was obtained.

Table XI gives a comparison of the 1946-47 and 1938-39 groups by subject field groups. The objective of this table is to determine which of the two groups, those which took placement tests and those which did not take placement tests, attained the higher scholastic achievement in the various subject fields for which placement tests are now given.

By comparing the 1946-47 English group with the 1938-39 English group, it was found that the difference of the means was .11, the standard error of the difference .055, the D/σ_D 2.00, and the chances in 100 were 98, and in favor of the 1938-39 group. The results of the comparison of the 1946-47 mathematics group with the 1938-39 mathematics group show that the difference of the means was .16, the standard error of the difference was .104, the D/σ_D was 1.54, and that there were

TABLE XI. COMPARISON OF 1946-47 AND 1938-39 GROUPS BY SUBJECT FIELD GROUPS

Group	Cases	Mean	Sigma	σ_M	D_M	σ_D	$\frac{D}{\sigma_D}$	Chances in 100	In Favor Of
1946-47 - Eng. (All)	297	1.31	.72	.042	.11	.055	2.00	98	1938- 1939 Group
1938-39 - Eng. (All)	338	1.42	.66	.036					
1946-47- Math. (All)	101	1.32	.81	.081	.16	.104	1.54	93	1938- 1939 Group
1938-39- Math. (All)	146	1.48	.79	.066					
1946-47 - Bio. (All)	90	1.41	.79	.083	.09	.113	.80	79	1938- 1939 Group
1938-39 - Bio. (All)	135	1.50	.89	.077					
1946-47-Physics (All)	42	1.28	.87	.133	.28	.156	1.79	96	1938- 1939 Group
1938-39 -Physics (All)	90	1.56	.77	.081					
1946-47- History (All)	176	1.21	.76	.057	.09	.106	.87	80	1946- 1947 Group
1938-39 - History (All)	66	1.30	.76	.093					

93 chances in 100 that the difference was real and in favor of the 1938-39 group.

The results of the comparison of the 1946-47 biology group with the 1938-39 biology group show that the mean difference was .09, the standard error of the difference was .113, the D/σ_D was .80, and that there were 79 chances in 100 that the difference was real and that the 1938-39 group was superior to the 1946-47 group. This indicates a slight trend toward significance.

In comparing the 1946-47 physics group with the 1938-39 physics group it was found that the difference of the means was .28, the standard error of the difference was .156, the D/σ_D was 1.79, and that there were 96 chances in 100 that the 1938-39 group was superior to the 1946-47 group. This indicates a fairly strong tendency toward significance.

In the comparison of the 1946-47 history group with the 1938-39 history group, it was found that the difference of the means was .09, the standard error of the difference was .106, the D/σ_D was .87, and that there were 80 chances in 100 that the 1946-47 history group was superior to the 1938-39 history group. This indicates a slight trend toward significance.

CHAPTER III

SUMMARY, CONCLUSIONS, SUGGESTIONS, AND VALUES

As stated in the introduction, the problem of this thesis is to attempt to discover some of the values of the placement tests used by Fort Hays Kansas State College, with the question in mind of whether or not they really fulfill their function. The purpose of the placement tests is to permit a student not to take certain basic courses in five subject fields provided he can demonstrate he has attained a sufficient mastery of the information which would ordinarily be presented in such courses. Thus it is logical to presume that if students are exempted from the basic courses, their scholastic achievement in additional courses taken in the field in which they are exempted should be at least comparable to, if not higher than the work done by students who were not exempted and who took additional work in the specific subject fields. It is in this light that the data presented in Chapter II will be interpreted in reference to the placement tests.

Since it requires time in order to build up hours of additional work in the various fields when a large number of courses are required to be taken, it may readily be understood why only those students who had completed at least four semesters of college were included in the study. It would have been desirable to have based the study on even a greater number of semesters, but the time factor obviated this possibility. The conclusions about each subject field and the corresponding placement tests will be presented in this order: English,

mathematics, biology, physics, and history.

Since, as indicated previously, a D/σ_M of 3.00 is considered to be a significant, it may be assumed that in all cases where the exempted students have a D/σ_M ratio of 3.00 or more that the placement test was reliable and that the administrators of the test had the logical right to assume, on the basis of the test results, that these students had a sufficient mastery of the subject field to be exempted from the basic course involved. A D/σ_M of 3.00 or more indicates that there are 100 chances in 100, or virtual certainty, that the obtained result is reliable.

An examination of the data presented in reference to comparison of the English groups shows that in two cases there are 100 chances in 100 that the results were significant. These were the cases in which the superiority of the 1947 exempted group over the 1947 non-exempted group and the superiority of the 1947 exempted group over the 1946-47 English group was demonstrated. Since these two results may be considered significant, it may be said that the exemption point was sufficiently high in the English test to insure that those students coming to that point deserved to be exempted from the basic course. Whether or not the exemption line was not low enough to include all students who deserved to be exempted from the basic course, it is beyond the scope of this thesis to determine. However, it may be safely assumed that the English placement tests effectively fulfilled their function insofar as they exempted only students who deserved exemption. Further indication of the validity

of this assumption is indicated by the fact that the means for all the non-exempted English groups in the 1946 and the 1947 groups were always lower than the lowest individual grade index of the exempted students.

No group within the mathematics group demonstrated a significant superiority over another group. However, in two cases there was demonstrated a strong tendency toward significance. These were in the cases of the 1946 exempted students as compared with the 1946 non-exempted students, in which case the exempted group showed a superiority possibility of 98 chances in 100; and in the case of the 1946-47 exempted group as compared with the 1946-47 non-exempted group, in which case the exempted group demonstrated a superiority possibility of 99 chances in 100. Further evidence of the superiority of the exempted groups is indicated by the fact that seventy-three per cent of the non-exempted students had a mathematics grade point of less than 1.00, whereas only twenty-three per cent of the exempted students had a mathematics grade index of less than 1.00. This last fact, however, brings to the fore another question, that of whether the exemption point should be increased and fewer students exempted. Since the data afford no basis for a positive statement concerning this question, only suggestions based on indicative information can be offered. However, it seems that the results of the study should indicate to an observer that too many exempted students in the mathematics field either do not have the background training necessary for success in advanced courses or they do not have the mental

capacity to do the work, other influential factors notwithstanding. The possibility that some exempted students should not have been exempted from the basic course is further indicated by the fact that of nine students who took the basic course although exempted from it, five of them had a mathematics grade index of less than 1.00. It is the writers belief that either the exemption point should be raised or that another test be substituted in place of the one used in the fall of 1946 and the fall of 1947 for the purpose of determining who should be exempted. This statement is qualified by the reminder that it is based only upon trends toward significance.

The data for the biology groups indicate little superiority in favor of either exempted or non-exempted groups over the other. The closest indication of superiority was in the case of the comparison of the 1946-47 exempted group with the 1946-47 non-exempted group, in which case the chances were 92 in 100 that the exempted group was superior.

The possibility that the taking of Biology 1 is not influential in determining achievement in additional courses is indicated by the results of the comparisons of the 1938 and the 1939 biology groups. In these groups it was found that the 1939 group which took Biology 1 showed a slight possibility of superiority over the group which did not take Biology 1. On the other hand, the 1938 biology group which did not take Biology 1 showed a fairly strong possibility of superiority over the 1938 group which did take Biology 1. When the two groups were combined, it was found that the 1938-39 group which did not take

Biology 1 indicated a superiority possibility of 94 chances in 100 over the group which took Biology 1.

The only conclusion that suggests itself in regard to the placement test in biology is that there is nothing in the data which would infer to any reliable extent that the test does not fulfill its function. On the same basis there is nothing reliable to indicate that it is effective in exempting only the deserving students.

In two of the cases in the physics group in which comparisons were made, it was found that in each case there were 99.4 chances in 100 that the exempted students were superior to the non-exempted students. This approaches very close to virtual certainty of a significant difference. When this result is coupled with the fact that there was practically no difference between the achievement of the 1938 and the 1939 groups which took Physical Science 1 and the 1938 and 1939 groups which did not take Physical Science 1, it is indicative of the fact that the physics placement test was fairly effective in indicating those students who were deserving of exemption from the basic course. The fact that the mean for the 1946-46 non-exempt group was .96 seems to indicate also that the test was fairly effective in that it indicated those who apparently were either lacking in background information which would aid them in this field or that they were a mentally poorer group. These conclusions, also, are necessarily based only upon trends toward significance.

The results of the comparisons of the history groups with one another showed no positive significant indication of superiority of

the exempted groups over the non-exempted groups, but in each case the trend toward significance was in favor of the group containing exempted students. In comparisons of the 1938 and 1939 groups, however, it was found that in one case the difference between the means was significant. This case was that comparing the 1938-39 history group which did not take Modern Civilization 4 with the 1938-39 history group which took Modern Civilization 4. The chances were 100 in 100 in favor of the group which took Modern Civilization 4. This would seem to indicate that the information gained by the students who took Modern Civilization 4 was of enough value to aid them in the additional courses taken. As to whether the history placement test is fulfilling its function of exempting those students who have a sufficient background in history, the data do not permit a positive statement. In light of evidence to the contrary, it must be presumed that the history placement tests fulfill their function.

Though it was found that there was little difference between the 1946-47 group and the 1938-39 group in scholastic achievement as a whole, 56 chances in 100 in favor of the 1938-39 group being little better than chance, it was found that the 1938-39 groups tended to do better in four of the five subject fields covered by this study. It should be noted, however, that in no subject field case did the 1938-39 groups or the 1946-47 groups demonstrate sufficient superiority to be considered as significant enough to be highly reliable.

Time: 50 Minutes.

Barrett-Ryan English TestNumber wrong
and omittedFor Grades VII-XII
and CollegeBy E. R. Barrett, and Teresa M. Ryan, Kansas State
Teachers College, and E. R. Wood,
New York University

FINAL SCORE

Name..... Age..... Grade

School..... State..... Date

I-A Punctuation

DIRECTIONS: In each of the following sentences one or more of the punctuation marks are enclosed in brackets. If the punctuation enclosed in brackets is correct, make a plus sign in the parenthesis before the sentence, as in "A" below. If any punctuation mark in brackets is not the correct mark for the place, make a minus sign in the parenthesis, as in "B" below.

Examples: A. (+) Mr[.] Brown came home today.

B. (—) I am[.] not going today.

The period after "Mr" in "A" is correct; therefore a plus sign is made in the parenthesis. The comma after "am" in sentence "B" is not correct; therefore a minus sign is made in the parenthesis.

1. () This is not John's letter; it is your[']s.
2. () All of my books except the one[.] which you have been reading[,] are in that box.
3. () Although I have seen that picture twice[,] I hope to see it again.
4. () Rocky Ford, Colorado[,] is famous for its melons.
5. () Henry inquired of the agent what time the train was due[?]
6. () When Lawrence saw the new car, he exclaimed, "How beautiful it is!"[.]
7. () My brother has gone back to Chicago[,] where he is now in business.
8. () Lyle came home last night; and all of us[,] therefore[,] are very happy.
9. () Ernest has frequently helped me when I was in need[;] I shall now do all I can for him.
10. () Do not make your n[']s look like u[']s.
11. () Tomorrow morning[,] Carl[,] I wish you would come to my office.
12. () "As for who won the prize[—]well, Alice did," announced the teacher.
13. () Mildred came to Emporia on September[,] 18, 1938.
14. () The new styles in mens['] shoes are now on display.
15. () At our school the janitor takes care of the girl[']s playground.
16. () Thomas Hardy[,] who was a great English novelist[,] was also a great poet.
17. () "I am glad to be here tonight," said the speaker. "I hope you will not be sorry that I came.[']" ["]Probably you will not agree with all that I say."
18. () I heard that two[—]hundred cars were parked on the vacant lot.
19. () Seventy[—]eight students signed the petition.
20. () Mother said to me, "When you write to James, tell him, [']A bird in the hand is worth two in the bush.[']"
21. () If Dorcas comes in when I am not here[;] please give her this book.
22. () "When the boys came home," said Mr. Brown[,] "I was surprised to see how well they looked."
23. () We had a long, hot, dusty[,] ride that day.
24. () January 13, 1937[,] is a day that I shall long remember.
25. () The boy had ability to learn, great ambitions, and sufficient funds[,] therefore his teachers urged him to go to college.
26. () The Hartford team won the first game[;] even though the best player was not in the game.
27. () You may go ["]Alice called out to us[']]
28. () I had three good reasons for staying at home: I had a good book to read; the weather was unpleasant; and I needed rest.
29. () The sun having set[,] we hurried home.
30. () Oscar is an excellent student in history[,] without any difficulty he remembers names and dates easily.

DIRECTIONS: In the following letter are fifteen numbered groups of words. Some of these groups make complete sentences; others do not. If the first group is a complete sentence, make a plus sign in the parenthesis to the left, numbered "71." If it is not a complete sentence, make a minus sign in the parenthesis. In like manner, in each numbered parenthesis make a plus sign if the group of words having the same number is a complete sentence, and a minus sign if the group is not.

Dear Mother,

71. () [71] Arrived in Denver at eleven o'clock this morning. [72] Sarah and I having come up from Colorado Springs to see this city. [73] We certainly having a good time. [74] Monday morning we were on Pike's Peak. [75] There to see the sun rise. [76] Which was surely one of the most glorious sights that I ever saw. [77] How we did enjoy it! [78] Many things of interest to be seen here. [79] Tomorrow one of the beautiful parks. [80] Where, they tell us, are many wild animals in cages. [81] Think that we are in danger of getting lost there? [82] Don't worry about us. [83] Aren't we old enough to take care of ourselves? [84] I'll write to you again soon. [85] Thanking you for what you did to make this trip possible for us.

Your loving daughter,
Mary.

III Verb Usage

DIRECTIONS: In each of the following sentences a word is enclosed in brackets. If this word is the correct word for the place, make a plus sign in the parenthesis before the sentence, as in "A" below. If the word is not the correct one, make a minus sign in the parenthesis before the sentence, as in "B" below.

Examples: A. (+) I [wrote] a letter to Mother.
B. (—) John [eaten] three apples.

- 86. () The whistle had [blown] twice before we heard it.
- 87. () Leo had [broke] one of his radio bulbs the night before.
- 88. () Howard [come] home late that night.
- 89. () One of the boys [throwed] stones at the squirrel.
- 90. () The child had [fate] the candy.
- 91. () Ida may have [forgotten] to come.
- 92. () The clothes on the line had [began] to freeze.
- 93. () The water pressure was so strong that one of the pipes [burst].
- 94. () When we came home, a tree [lay] across the road.
- 95. () Jane had never before [rode] a horse.
- 96. () The class knew the bell had [rung]
- 97. () The debater thought that he had [proved] each point in his argument.
- 98. () My sister has not [drove] the new car yet.
- 99. () After we had [sung] another song, we were dismissed.
- 100. () Several students in my art class have [drawn] pictures for the art contest.

DIRECTIONS: Each of the following sentences marked "a" has a word in brackets. If the word is the correct grammatical form to be used in that place, make a plus sign in the parenthesis before the sentence. If the form is incorrect, make a minus sign in the parenthesis.

Under "b" is a reason for the form of the word to be used in the brackets in "a." If the reason is the correct one to be applied in this case, make a plus sign in the parenthesis before the reason. If the reason is not the correct one, make a minus sign in the parenthesis.

- Examples:
- 1. a. (+) I saw [him].
 - 2. b. (+) Objective case should be used, object of "saw."
 - 3. a. (—) [Me] heard her.
 - 4. b. (+) Nominative case should be used, subject of "heard."
 - 5. a. (+) We [are] one in purpose.
 - 6. b. (—) Singular number should be used, to agree with "we."
 - 7. a. (—) Let [he] go with me.
 - 8. b. () Nominative case should be used, subject of "let"

In these sentences, notice that a plus sign is placed in the parenthesis before a correct sentence and in the parenthesis before a correct reason. In the other parentheses, minus signs are placed. Notice that the sentence may be right and the reason wrong, or the sentence wrong and the reason right, or both right, or both wrong.

- 101. a. () I hope that the next girl we meet will be [she].
- 102. b. () Objective case should be used, object of "will be."
- 103. a. () The roar of the train did not prevent [my] hearing what was said.
- 104. b. () Possessive case should be used, to modify "hearing."
- 105. a. () I fear that Paul overheard [us] girls talking about him.
- 106. b. () Nominative case should be used, to agree with "girls."
- 107. a. () Tom's sister can read much more rapidly than [him].
- 108. b. () Nominative case should be used, subject of verb understood.
- 109. a. () Both my sister and [myself] were eager to drive the car.
- 110. b. () Compound personal pronoun, "myself," should be used after "and."
- 111. a. () He was happy and [I], too.
- 112. b. () Nominative case should be used subject of verb understood.

I-B Capitalization

DIRECTIONS: Make a plus sign in the parenthesis before each sentence in which the capital letters are correctly used, as in "A" below. Make a minus sign in the parenthesis before each sentence that has in it a capital letter where a small letter should be used, as in "B" below, or a small letter where a capital should be used, as in "C" below.

Examples: A. (+) I saw Ben enter the store.
B. (—) I Saw Ben enter the store.
C. (—) i saw Ben enter the store.

31. () The students of Forest College are expected to read a passage from the Bible every day.
32. () I liked Professor Brown better than any other professor in the college.
33. () Poe wrote the story, "The Fall of the House of Usher."
34. () Many indians and negroes took part in the pageant.
35. () All of Mrs. Brown's sons came home for Thanksgiving Day.
36. () Last Spring we had heavy rains.
37. () Dorothy attended the Chase County High School for four years.
38. () "If I had been there," he said, "This would not have happened."
39. () John Jones was elected President of his class.
40. () My sister has enjoyed studying history and English.

II-A Sentence Structure and Diction

DIRECTIONS: In each of the following sentences a word or a group of words is enclosed in brackets. If this word or word group is correctly used in the sentence, make a plus sign in the parenthesis before the sentence, as in "A" below. If the word or word group is incorrect or is wrongly placed, make a minus sign in the parenthesis, as in "B" below.

Examples: A. (+) You surely [heard] what the speaker said.
B. (—) I [ain't] going to school today.

41. () We saw [most] all the games that our school played.
42. () Both of Ben's sisters are [light-complected].
43. () Lillian [had ought] to have answered when her name was called.
44. () The murderer was [hanged] Saturday.

45. () Mr. Green was a man whom we trusted fully, [and who] proved himself to be worthy of being trusted.
46. () No coach can [learn] him to play the game.
47. () May and Nora went home last night all by [themselves].
48. () A [saleswoman] came to me and asked if I wished something.
49. () The fog was so thick that we [could hardly] see across the street.
50. () I do not have [more than] two lessons to get for tomorrow.
51. () His message, [which] came too late, had been delayed by the storm.
52. () The man standing nearest the counter is the [party] we want.
53. () I went back to my seat and [set] down to wait for the bell.
54. () [After writing] the theme, it was laid on the desk.
55. () [Being delayed] by a late dinner, it was too late for us to go to the first show.
56. () My brother [being] with me, I felt safer.
57. () The child [irritated] me with many questions.
58. () The lamp [sits] on the table near the door.
59. () Philip's [being absent] more than half of the time prevented him from getting a grade in the course.
60. () The [effect] of his words was good.
61. () John looked up every fact to which there was an [allusion] in the essay.
62. () His writing was poorer than [an average third-grade pupil].
63. () I cannot find your book [anywheres].
64. () We had [all ready] finished the work when he came.
65. () The mail carrier fell off [of] his horse.
66. () You boys [ought not] to have done that.
67. () It seems [like] I ought to know you.
68. () The [taller] of the twins was here today.
69. () [May] I borrow your pen for a few minutes, please?
70. () Mr. Jackson sold all of his wheat before the price had [raised].

113. a. () [Who] did you say was in the car with you?
114. b. () Objective case should be used, object of "say."
115. a. () For the position, boy after boy [has] been named by the principal.
116. b. () Plural number should be used, to agree with "boy after boy."
117. a. () The mayor, together with the aldermen, [approves] of the new city park.
118. b. () Plural number should be used, to agree with "mayor" and "aldermen."
119. a. () Between you and [I], Tom does not believe a word of that story.
120. b. () Nominative case should be used, subject of verb understood.
121. a. () Each man, woman, and child in the company [expects] a present.
122. b. () Plural number should be used, to agree with "man, woman, and child."
123. a. () When he spoke, his voice sounded [harsh] to me.
124. b. () Adjective should be used, in the predicate with "sounded."
125. a. () The principal told James and [I] to report in the office.
126. b. () Nominative case should be used, subject of "to report."
127. a. () This is one of the houses which [is] for sale.
128. b. () Plural number should be used, to agree with "which."
129. a. () When the car came, there [were] not any one of us ready to go.
130. b. () Plural number should be used, to agree with "any."
131. a. () Our glee club sings [good].
132. b. () Adverb should be used, to modify "sings."
133. a. () The coach wishes that Smith [were] here for the broad jump.
134. b. () Subjunctive mode should be used.
135. a. () I want [whoever] it is that is making that noise to be quiet for a few minutes.
136. b. () Objective case should be used, object of "want."
137. a. () [Whoever] you speak to will feel honored.
138. b. () Nominative case should be used, subject of "will feel."
139. a. () We had never seen Uncle Frank, but we soon knew our visitor to be [him].
140. b. () Objective case should be used to agree with "visitor."
141. a. () Every one of the boys at the party [was] glad Mr. Owen was there.
142. b. () Singular number should be used, to agree with "one."
143. a. () Write down the names of those [who] you think should be invited.
144. b. () Objective case should be used, to agree with "those."
145. a. () To Esther and [I] came the good news that we were elected delegates.
146. b. () Nominative case should be used, subject of "came."
147. a. () That cake looks [good].
148. b. () Adjective should be used, in the predicate with "looks."
149. a. () Four dollars [is] a small price to pay for that book.
150. b. () Plural number should be used, to agree with "dollars."

DIRECTIONS: Make your answers stand out clearly. Use margins on other vacant spaces for scratch work.

1. Add

$$\begin{array}{r} 387 \\ 435 \\ \hline 129 \end{array}$$

9. Express as per cent

$$.064$$

Ans.....

2. Subtract

$$\begin{array}{r} 506 \\ 237 \\ \hline \end{array}$$

10. 12 is $\frac{1}{3}$ of 30

Ans.....

3. Multiply

$$\begin{array}{r} 473 \\ 67 \\ \hline \end{array}$$

11. 250% of 180 =

Ans.....

12. At 30 miles per hour, how many minutes would it take to travel 3 miles?

Ans.....

4. Divide

$$36 \over 2466$$

13. A merchant bought a supply of 80 bushels of potatoes. After he sold 48 bushels what fraction of his supply remained?

Ans.....

5. Multiply

$$\frac{2}{3} \times \frac{1}{5}$$

14. Underline the largest of the following numbers.

$$.418 \quad .417 \quad .41732 \quad .41798$$

Ans.....

6. Divide

$$\frac{11}{14} \div 3 \frac{1}{7}$$

15. How much larger is the number you underlined than the next largest number in the group?

Ans.....

7. Add

$$\frac{2}{3} + \frac{3}{4} + 3\frac{1}{2}$$

16. A boy mows a rectangular plot beginning at one corner and cutting a 16 inch path completely around the plot. If the rectangle is 50 ft. by 32 ft. how many trips must he make around the plot to mow it?

Ans.....

Ans.....

8. Multiply

$$\begin{array}{r} 3.01 \\ .023 \\ \hline \end{array}$$

DIRECTIONS: Make your answers stand out clearly. Use margins or other vacant spaces for scratch work.

1. Write as an equation:

The quantity $2n-5$ is 7 more than n .

Ans.....

2. Solve each of the following equations for x :

2. $4x-2 = 14$

$x = \dots\dots\dots$

3. $\frac{2x}{3} = 12$

$x = \dots\dots\dots$

4. $5x-8 = 2x-50$

$x = \dots\dots\dots$

5. $\frac{3}{x} + \frac{1}{2x} = \frac{7}{3}$

$x = \dots\dots\dots$

6. Rewrite without parentheses and combine like terms:

$18x + 15 - (3x-2)$

Ans.....

7. The sum of two numbers is s . If one of the numbers is y , what is the other?

Ans.....

8. Write a formula for the number of gallons of water (call this number n) that can be put into a rectangular tank x ft. by y ft. by w ft., if each cu. ft. of space will contain $7\frac{1}{2}$ gallons of water.

Ans.....

9. $a^2 \cdot a^4 = \dots\dots\dots$

10. If both the length and width of a rectangle are increased by 50%, the effect is to multiply the area by what number?

Ans.....

11. The second of three numbers is 2 more than twice the first, and the third number lacks one of being just five times the first. The third number is 60 more than the second. What are the numbers?

The numbers are.....

12. Factor: $25x + 50y$

Ans.....

13. Reduce: $\frac{x^2-9}{x^2+x-12}$

Ans.....

14. Combine: $2 + \frac{3}{x}$

Ans.....

15. Simplify:

$\sqrt{x^4 + 4x^2y^2 + 4y^4}$

Ans.....

16. Obtain the common solution:

$\begin{cases} 2x + y = 14 \\ 3x + 2y = 23 \end{cases}$

$x = \dots\dots\dots$

$y = \dots\dots\dots$

17. Solve for B :

$A + \frac{C}{B} = 2$

Ans.....

18. Solve for x :

$x^2 - 2x = 15$

Ans.....

19. Solve for x :

COÖPERATIVE BIOLOGY TEST

44

REVISED SERIES FORM P

by
F. L. FITZPATRICK, Teachers College, Columbia University
and
S. R. POWERS, Teachers College, Columbia University



Please print:

Name _____ Date _____
Last First Middle

Grade or Class _____ Age _____ Date of Birth _____
Yrs. Mos.

School _____ City _____ Sex _____
M. or F.

Instructor _____

Number of years you have studied biology: (one semester = $\frac{1}{2}$ year; one quarter = $\frac{1}{3}$ year) _____

General Directions: Do not turn this page until the examiner tells you to do so. This examination consists of two parts, and requires 40 minutes of working time. The directions for each part are printed at the beginning of the part. Read them carefully, and proceed at once to answer the questions. **DO NOT SPEND TOO MUCH TIME ON ANY ONE ITEM; ANSWER THE EASIER QUESTIONS FIRST;** then return to the harder ones, if you have time. There is a time limit for each part. You are not expected to answer all the questions in any part in the time limit; but if you should, go on to the next part. If you have not finished Part I when the time is up, stop work on that part and proceed at once to Part II. No questions may be asked after the examination has begun.

By exercising careful judgment and making shrewd guesses you may profitably answer questions about which you are not absolutely sure; but since your score will be the number of correct answers diminished by a number proportional to the number of wrong answers, you should avoid answering questions about which you are totally ignorant. Shrewd guessing based on intelligent inference will improve your score, but wild guessing on questions that are entirely unknown to you will waste time which you could better put on other questions in the test, and may result in a large subtraction from the number of your correct answers.

Part	I	II	Total
Minutes	25	15	40

Scaled Score	Percentile

PART I

Directions: Each of the following incomplete statements or questions is followed by five possible answers. Select the one that is most appropriate and put its **number** in the parentheses at the right.

1. A scientist discovers new facts by
 - 1-1 consulting the writings of Aristotle.
 - 1-2 thinking about the probabilities.
 - 1-3 making careful observations and conducting experiments.
 - 1-4 debating questions with his friends.
 - 1-5 referring to the works of Darwin. 1()
2. Which of the following scientists did the most to develop our knowledge of germs in relation to diseases?
 - 2-1 Galen.
 - 2-2 Weismann.
 - 2-3 Lavoisier.
 - 2-4 Galton.
 - 2-5 Pasteur. 2()
3. It is a cold winter day, and you are warming up the engine of your car in the garage. You leave the doors of the garage wide open because otherwise
 - 3-1 there may soon be too much moisture in the air.
 - 3-2 there may soon be too much carbon monoxide in the air.
 - 3-3 the gasoline fumes are likely to cause an explosion.
 - 3-4 there will be no oxygen left in the air after a minute or two.
 - 3-5 there will soon be too much carbon dioxide in the air. 3()
4. The energy which green plants use in making foods usually comes from
 - 4-1 the soil.
 - 4-2 sunlight.
 - 4-3 the plant roots.
 - 4-4 water.
 - 4-5 oxygen in the air. 4()
5. Which of the following would have the greatest fuel value as human food?
 - 5-1 Three pounds of tomatoes.
 - 5-2 One pound of butter.
 - 5-3 One pound of lean beef.
 - 5-4 Two pounds of spinach.
 - 5-5 One pound of bread. 5()
6. It is found that a specialized cell conducts impulses, but performs no other function well. Such a cell would best be classified as a(n)
 - 6-1 muscle cell.
 - 6-2 gland cell.
 - 6-3 epithelial cell.
 - 6-4 cartilage cell.
 - 6-5 nerve cell. 6()
7. The living substance which is found in both plant and animal cells is
 - 7-1 keratin.
 - 7-2 thyroxin.
 - 7-3 pepsin.
 - 7-4 protoplasm.
 - 7-5 chlorophyll. 7()
8. You think that you are overweight, and wish to do something about it. Which one of the following is the most sensible procedure?
 - 8-1 Stop eating altogether for a week.
 - 8-2 Eat nothing but bananas and water for two weeks.
 - 8-3 Select an advertised reducing compound.
 - 8-4 Eat nothing but protein foods until you become thinner.
 - 8-5 Get the advice of a physician. . . 8()
9. You are about to build a summer cottage in the country. You have learned that termites are common in the region, and that they have destroyed the timbers of other cottages nearby. You can probably avoid most of the termite nuisance by
 - 9-1 placing the cottage at least one hundred yards from any pond or stream.
 - 9-2 using only yellow pine in building the cottage.
 - 9-3 making sure that the lower floor of the cottage rests firmly upon the soil.
 - 9-4 putting a good concrete, stone, or brick foundation under the cottage so that no woodwork is in contact with the soil.
 - 9-5 building the cottage during the colder months of the year. . . 9()
10. You have a bad cold accompanied by fever. Of the following, the best thing to do is to
 - 10-1 eat plenty of protein foods.
 - 10-2 go to bed.
 - 10-3 get plenty of exercise.
 - 10-4 avoid drinking very much water.
 - 10-5 drink plenty of milk. 10()
11. We wish to know whether overeating affects the probable length of life. A scientific approach to this problem would be to
 - 11-1 see what the ancient Greek philosophers thought about the matter.
 - 11-2 perform a laboratory experiment with two groups of white rats, one group consistently overfed and the other group kept on a normal diet.
 - 11-3 ask fifty people selected at random, and determine their average opinion.
 - 11-4 study food advertisements that relate to the problem.
 - 11-5 ask ten old people what they ate. 11()

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- 12-2 Garter snake.
12-3 Bull snake.
12-4 Fox snake.
12-5 Blue racer. 12()
3. A winter coat is about to be put away for the summer in a home where there are clothes moths. Which of the following procedures is most likely to protect the coat from attacks of moth larvae?
- 13-1 Steam-press the coat and seal it in a paper bag.
13-2 Store the coat with cotton clothing.
13-3 Put some moth balls in the coat pockets, and hang the coat in an attic.
13-4 Dust the coat with arsenic and hang it in a closet.
13-5 Hang the coat in the basement. 13()
14. You are preparing to open a can of food when you notice that the ends of the can are bulged outward. When the can is opened, the contents have a sour odor. The best thing to do is:
- 14-1 forget about the matter and eat the food.
14-2 put some soda in the food to counteract its acid condition.
14-3 throw the food away.
14-4 cook the food before it is eaten.
14-5 heat the food to a temperature of 165° F. before it is eaten. 14()
15. A mature ovum and a mature sperm come together. The sperm unites with the ovum. This process is called:
- 15-1 cleavage.
15-2 budding.
15-3 regeneration.
15-4 fertilization.
15-5 maturation. 15()
16. You are about to eat some pork sausage. You say: "We should cook this sausage thoroughly before we eat it. It might contain some:
- 16-1 trichinae."
16-2 nematocysts."
16-3 flukes."
16-4 malaria germs."
16-5 hookworms." 16()
17. We find that in a cactus there are no broad leaves, and the stem is adapted for food-making purposes. Such an adaptation serves to:
- 17-1 conserve water.
17-2 furnish protection against enemies.
17-3 increase the rate of transpiration.
17-4 give the plant contact with more sunlight.
17-5 give the cactus an advantage over broad-leaved plants in regions where the rainfall is heavy. 17()
- 18-1 frog.
18-2 fish.
18-3 tree.
18-4 moss.
18-5 bacterium. 18()
19. In the following list a plant that cannot manufacture its own foods is a:
- 19-1 moss.
19-2 Spirogyra.
19-3 liverwort.
19-4 apple tree.
19-5 mold. 19()
20. You discover that the plants in your garden are covered with aphids or "plant lice." Some of the plants are being killed. A good way to get rid of the pests would be to:
- 20-1 spray the plants with kerosene emulsion.
20-2 cut off the plants, allow them to dry, and then burn them.
20-3 plant something else the following year.
20-4 set out poison baits.
20-5 scatter poison dust upon the plants. 20()
21. The trees are cut from a hilly area, which is then used as pasture land. After a time ditches begin to appear on the hill-sides. They become deeper and more numerous. Years pass, and it is decided that the land shall be allowed to go back to forest. However, it is soon evident that trees will not grow so well as formerly. One reasonable explanation is that:
- 21-1 trees will not grow well on land that has been pastured.
21-2 much of the fertile topsoil has been washed away.
21-3 the soil has become too moist.
21-4 there is a lack of oxygen in the soil.
21-5 trees will not grow where other trees have grown. 21()
22. A certain dairy has a herd of cattle which have been tested and found to be free from tuberculosis. The dairy markets its milk in the "raw" or unpasteurized condition. This milk:
- 22-1 is certain to be free from disease germs.
22-2 may be unsafe to drink.
22-3 is easier to digest than pasteurized milk.
22-4 contains more calories than pasteurized milk.
22-5 is safer than ordinary pasteurized milk. 22()

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23. A city located on the banks of a river is considering ways and means of sewage disposal. One of the best things to do from the standpoint of health and sound economy is to
- 23-1 pipe the sewage into the river at a point at least two miles downstream.
 - 23-2 build a number of cesspools about town and pipe the sewage to them.
 - 23-3 build a sewage-disposal plant.
 - 23-4 leave the disposal of sewage to the individual property owner.
 - 23-5 pipe the sewage out upon plowed fields near the city. 23()
24. Which one of the following would favor the presence of many clothes moths in a community?
- 24-1 Screening windows so that moths could not escape from homes.
 - 24-2 Having all clothing in more or less constant use.
 - 24-3 Allowing old clothing to accumulate in attics.
 - 24-4 Planting barberry bushes around homes.
 - 24-5 Failing to rake up leaves in yards. 24()
25. One reason why forest fires are very destructive is that much valuable timber is burned. Another economic loss results from the fact that
- 25-1 too much carbon dioxide is added to the atmosphere.
 - 25-2 the air becomes too dry in this region.
 - 25-3 a great deal of oxygen is used in the burning process.
 - 25-4 the fire is likely to bring on heavy rains.
 - 25-5 materials on the forest floor are also destroyed. 25()
26. A certain rural community is marked by the presence of great numbers of houseflies during the summer months. Which one of the following procedures would probably bring about the greatest reduction in the housefly population?
- 26-1 Burning sulphur in every home once a week.
 - 26-2 Draining the nearby marshes.
 - 26-3 Screening all the windows and doors.
 - 26-4 Spreading all manure out on the fields.
 - 26-5 Having all the people use fly-repelling lotions. 26()
27. Which of the following measures would probably produce the greatest reduction in the number of automobile accidents?
- 27-1 Doing away with all speed limits.
 - 27-2 Making public liability insurance compulsory.
 - 27-3 Putting up safety posters at dangerous spots.
 - 27-4 Requiring all drivers to carry their licenses with them.
 - 27-5 Refusing to permit people to drive if they have had two or more accidents. 27()
28. There are numerous cases of typhoid fever in a certain community. It is proposed that something be done to improve conditions. One sensible thing to do would be to
- 28-1 put oil on the surface of nearby swamps.
 - 28-2 examine the water supply.
 - 28-3 burn sulphur daily in all homes.
 - 28-4 close the schools and theatres.
 - 28-5 encourage people to drink more milk. 28()
29. If there were an epidemic of diphtheria in your community, which one of the following would probably be in greatest danger?
- 29-1 A six-year-old boy who had been inoculated for diphtheria.
 - 29-2 A day laborer who had survived diphtheria as a child.
 - 29-3 An elderly man.
 - 29-4 A five-year-old child who had not been inoculated.
 - 29-5 An elderly woman. 29()
30. A certain disease becomes common in a given community. It is suspected that this disease is carried to man by some small blood-sucking insect. In the following list, suspicion might well center upon
- 30-1 grasshoppers.
 - 30-2 ladybird-beetles.
 - 30-3 ichneumon flies.
 - 30-4 Japanese beetles.
 - 30-5 fleas. 30()
31. The following five diseases are represented in a community. Which one of them can probably *not* be made less common by improving the environment?
- 31-1 Haemophilia.
 - 31-2 Malaria.
 - 31-3 Typhoid fever.
 - 31-4 Tuberculosis.
 - 31-5 Rickets. 31()

Go on to the next page.

- people from becoming infested. One good thing to do would be to
- 32-1 urge all people to wear shoes.
- 32-2 urge people to stay indoors during rainy weather.
- 32-3 cut away the brush from the margins of streams and ponds.
- 32-4 boil all water used for drinking purposes.
- 32-5 see that people have enough vitamin A in their diets. 32()
33. It is often undesirable to plow dry prairie land because
- 33-1 nothing will grow there.
- 33-2 serious damage may result from wind erosion.
- 33-3 the soil is usually not fertile.
- 33-4 this makes the land unfit for raising forests.
- 33-5 water runs off too rapidly after a rain. 33()
34. Poison baits are often set out in fields and gardens for the purpose of killing undesirable insects. Such a practice, however, is not always desirable. Because
- 34-1 the poison baits may retard the growth of plants.
- 34-2 insects are not injured by stomach poisons.
- 34-3 the fertility of the soil is reduced.
- 34-4 harmful insects will not eat poison baits.
- 34-5 organisms other than insects may eat the baits. 34()
35. It is found that a certain species of animal makes no provision for the care of its young. Probably such an animal
- 35-1 lives in the water.
- 35-2 lives in the ground.
- 35-3 produces large numbers of eggs.
- 35-4 is warm-blooded.
- 35-5 feeds largely upon plant materials. 35()
36. You are examining a type of insect that is new to you, although you know that it is commonly found on the bodies of certain animals. You find that its mouth parts include a tube, surrounded by a number of pointed bristles. These facts suggest that the insect
- 36-1 eats the hair of animals.
- 36-2 does not take food when in the adult state.
- 36-3 is a blood-sucking type.
- 36-4 probably eats the leaves of plants.
- 36-5 cannot be a carrier of disease. . . 36()
- 37-1 be parasitic.
- 37-2 live in symbiotic association.
- 37-3 bear flowers.
- 37-4 bear edible fruits.
- 37-5 be a monocot. 37()
38. You are studying the blood of an earthworm. You find that it is made up of a plasma which contains haemoglobin. There are some corpuscles which are colorless, and do not contain haemoglobin. These facts suggest that
- 38-1 this blood does not carry oxygen to the cells.
- 38-2 the corpuscles are carriers of oxygen.
- 38-3 the corpuscles are carriers of liquid wastes.
- 38-4 an earthworm does not use oxygen.
- 38-5 the plasma is a carrier of oxygen. 38()
39. Y represents yellow, which is dominant. G represents green, which is recessive. YY is crossed with Gg. Which of the following statements concerning the offspring (first generation) is true?
- 39-1 Two will be yellow and two will be green.
- 39-2 All of them will be yellow.
- 39-3 All of them will be green.
- 39-4 Three will be yellow and one will be green.
- 39-5 Three will be green and one will be yellow. 39()
40. B is black, which is dominant. W is white, which is recessive. BW is crossed with WW. Which of the following represents the ratio in which the offspring will appear?
- 40-1 3 BB plus 1 BW.
- 40-2 3 BW plus 1 WW.
- 40-3 2 BW plus 2 WW.
- 40-4 1 BB plus 3 BW.
- 40-5 2 BB plus 2 BW. 40()
41. One of the concepts in Darwin's theory of natural selection is the concept of
- 41-1 conservation of energy.
- 41-2 inheritance of acquired characters.
- 41-3 the gene in heredity.
- 41-4 the survival of the fittest.
- 41-5 spontaneous generation. . . . 41()
42. Robert Hooke examined slices of cork with the aid of a microscope, and discovered that cork was
- 42-1 lighter than water.
- 42-2 filled with protoplasm.
- 42-3 soluble in alcohol.
- 42-4 made up of cells.
- 42-5 useful in industry. 42()

Go on to the next page.

43. An ovum has been fertilized. It passes through a prophase, a metaphase, an anaphase, and a telophase. The result is the production of two daughter cells. This type of division is a case of
 43-1 atrophy.
 43-2 transverse fission.
 43-3 mitosis.
 43-4 oögenesis.
 43-5 asexual reproduction. 43()
44. Green plants that live in the water are usually found rather close to the surface (within 100 feet). This is because
 44-1 water at greater depths is too cold.
 44-2 there is too much sediment in water at greater depths.
 44-3 water at greater depths does not contain oxygen.
 44-4 not enough sunlight penetrates to the greater depths.
 44-5 water at greater depths is too warm. 44()
45. The process by means of which energy is released within cells is
 45-1 oxidation.
 45-2 degeneration.
 45-3 sublimation.
 45-4 suspension.
 45-5 assimilation. 45()
46. We find that a certain animal has a blood temperature that ranges between 100° F. and 105° F. This temperature is maintained both in cold and in warm weather. The evidence suggests that the animal is
 46-1 warm-blooded.
 46-2 placental.
 46-3 symbiotic.
 46-4 cold-blooded.
 46-5 subterranean. 46()
47. Which of the following best describes the pasteurization of milk?
 47-1 Heating milk to 145° F. for thirty minutes.
 47-2 Adding chlorine to milk to kill germs.
 47-3 Boiling milk for twenty minutes.
 47-4 Subjecting milk to the quick-freezing process.
 47-5 Adding one per cent of acetic acid to milk. 47()
48. One reason why an earthworm is considered to be an invertebrate is that an earthworm
 48-1 lives in the soil.
 48-2 has no backbone.
 48-3 has a nervous system.
 48-4 has no eyes.
 48-5 has no lungs. 48()
49. One of the functions of a cell membrane is to
 49-1 make food.
 49-2 release energy from food.
 49-3 enable the cell to move about.
 49-4 control what will enter and leave the cell.
 49-5 convey hereditary characters from one generation to another. 49()
50. The nodules containing bacteria on the roots of legumes are important to man because
 50-1 they are good feed for pigs.
 50-2 they make the soil more porous.
 50-3 they contain nitrogen-fixing bacteria.
 50-4 green plants will not grow without them.
 50-5 they tend to destroy the plants. . 50()
51. An insect (A) is found to be living in the hair of a mammal (B). A feeds by sucking the blood of B. B does not profit through the presence of A. This evidence indicates that A is a
 51-1 hermaphrodite.
 51-2 parasite.
 51-3 larva.
 51-4 saprophyte.
 51-5 symbiont. 51()
52. One function of a red corpuscle in the human blood is to
 52-1 destroy wastes.
 52-2 regulate temperature.
 52-3 combat disease germs.
 52-4 carry oxygen.
 52-5 carry protein wastes. 52()
53. A disease which is associated with the lack of iodine in the diet is
 53-1 cancer.
 53-2 simple goiter.
 53-3 diabetes.
 53-4 yellow fever.
 53-5 hardening of the arteries. . . . 53()
54. A certain body fluid is found to be secreted by a gland. It is discharged directly into blood vessels, and carried to various parts of the body. It regulates the metabolism of cells with which it comes in contact. The evidence suggests that this fluid is
 54-1 a hormone.
 54-2 destructive to tissues.
 54-3 a vitamin.
 54-4 a stimulant.
 54-5 a waste product of metabolism. 54()
55. In the human body some proteins are digested by a pancreatic enzyme known as
 55-1 ptyalin.
 55-2 lipase.
 55-3 trypsin.
 55-4 pepsin.
 55-5 maltase. 55()

- 50-2 glycogen.
56-3 glycerol.
56-4 amino acids.
56-5 simple sugars. 56()

57. The scientist who discovered the bacillus of tuberculosis was
57-1 Koch.
57-2 Linnaeus.
57-3 Van Helmont.
57-4 Mendel.
57-5 Harvey. 57()

58. A vitamin whose absence from the diet is associated with scurvy is
58-1 vitamin A.
58-2 vitamin B.
58-3 vitamin C.
58-4 vitamin D.
58-5 vitamin E. 58()

59. The formation of fossils is most likely to occur
59-1 on the bottom of a shallow sea.
59-2 on the bottom of a lake.
59-3 in a plowed field.
59-4 in a river bed.
59-5 in a pond. 59()

60. The gypsy moth is injurious because its larvae
60-1 carry disease germs.
60-2 eat the leaves of trees.
60-3 destroy cotton clothing.
60-4 eat garden vegetables.
60-5 destroy field crops. 60()

61. In all fairly complex animals the skeleton and the muscles are developed from the primary germ layer known as the
61-1 ectoderm.
61-2 neurocoele.
61-3 epithelium.
61-4 endoderm.
61-5 mesoderm. 61()

62. Four stages in complete metamorphosis of an insect are the egg, the larva, the adult, and the
62-1 embryo.
62-2 pupa.
62-3 cyst.
62-4 maggot.
62-5 nymph. 62()

63. A salamander does not develop scales, plates, feathers, or hair. It has, however, a backbone, gills, and a three-chambered heart. It is cold-blooded. It would be classified as a(n)
63-1 mammal.
63-2 fish.
63-3 reptile.
63-4 invertebrate.
63-5 amphibian. 63()

- might reasonably say would be,
64-1 "There seem to have been a lot of termites around here."
64-2 "There may have been some codling moths here when the trees were in bloom."
64-3 "This shows what ladybird-beetles will do."
64-4 "This would not have happened if the trees had been sprayed last fall."
64-5 "Look at this stable fly larva in the apple." 64()

65. There are 48 chromosomes in the un-maturated sex cell of a given species. How many chromosomes would probably be in a maturated sex cell of this species?
65-1 Twelve.
65-2 Sixteen.
65-3 Ninety-six.
65-4 Sixty-four.
65-5 Twenty-four. 65()

66. Amphioxus is an animal which develops a notochord, gill slits, and a dorsal hollow nervous system. It does not develop hair, a vertebral column, scales, or plates. It would be classified as a
66-1 mollusk.
66-2 vertebrate.
66-3 worm.
66-4 chordate.
66-5 reptile. 66()

67. The branching structure of a moss that spreads out upon the surface of the soil is a
67-1 mycelium.
67-2 hypha.
67-3 petiole.
67-4 protonema.
67-5 cambium. 67()

68. Dr. Edward Jenner's vaccination for smallpox was based upon the fact that
68-1 smallpox is a common disease of children.
68-2 people who have had cowpox are immune to smallpox.
68-3 he discovered the germ of smallpox.
68-4 people who have been vaccinated for smallpox may give the disease to other people.
68-5 humans cannot develop immunity to smallpox. 68()

Go on to the next page.

69. Carbohydrates and fats contain the elements
 69-1 carbon, hydrogen, and oxygen.
 69-2 carbon, hydrogen, and nitrogen.
 69-3 carbon, hydrogen, and sulphur.
 69-4 carbon, nitrogen, and sulphur.
 69-5 carbon, calcium, and oxygen. . 69()
70. The enzyme of human saliva changes
 70-1 proteins to peptones.
 70-2 starches to sugars.
 70-3 fats to fatty acids.
 70-4 sugars to starches.
 70-5 proteins to amino acids. 70()
71. Cellulose is a
 71-1 digestive enzyme.
 71-2 fluid of the blood.
 71-3 substance found in the walls of plant cells.
 71-4 material from which chromosomes are formed.
 71-5 hormone secreted by the pancreas. 71()
72. In the following list, a cell capable of producing a new organism without being fertilized is a
 72-1 spore.
 72-2 muscle cell.
 72-3 nerve cell.
 72-4 corpuscle.
 72-5 phagocyte. 72()
73. One reason why an oak tree is considered to be a spermatophyte is that an oak tree
 73-1 produces seeds.
 73-2 can grow on fairly moist soil.
 73-3 has broad leaves.
 73-4 is a green plant.
 73-5 loses its leaves during the winter season. 73()
74. Comparison of such plants as algae, liverworts, mosses, ferns, club mosses, and flowering plants, furnishes evidence that
 74-1 the sporophyte generation is best developed among higher plants.
 74-2 the gametophyte generation is best developed among higher plants.
 74-3 all plants are saprophytic.
 74-4 the lower plants exhibit the best development of circulatory structures.
 74-5 all plants produce seeds. 74()
75. All chordates develop a
 75-1 four-chambered heart.
 75-2 nematocyst.
 75-3 gizzard.
 75-4 seta.
 75-5 notochord. 75()

below are to be answered by referring to the appropriate diagram and placing in the parentheses the number of the word or phrase in the left-hand column of that group which best describes the portion of the diagram indicated.

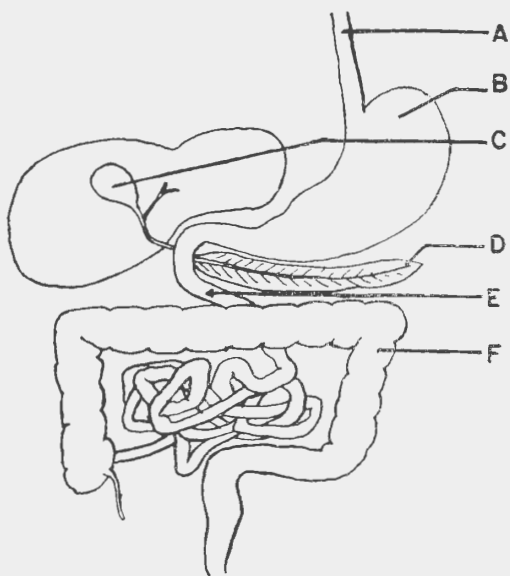


Fig. 1. Diagram of Digestive Organs and Related Glands (Main)

- | | |
|-----------------|---|
| 1. bile duct | 1. The part labelled A (Fig. 1) is the _____. |
| 2. gall bladder | 2. The part labelled B (Fig. 1) is the _____. |
| 3. stomach | 3. The part labelled C (Fig. 1) is the _____. |
| 4. oesophagus | |
| 5. spleen | |
-
- | | |
|--------------------|---|
| 1. duodenum | 4. The part labelled D (Fig. 1) is the _____. |
| 2. pancreas | 5. The part labelled E (Fig. 1) is the _____. |
| 3. lacteal | 6. The part labelled F (Fig. 1) is the _____. |
| 4. large intestine | |
| 5. appendix | |

(Items 7 through 12 refer to Fig. 2)

- | | |
|-----------------|---|
| 1. air sac | 7. The part labelled A (Fig. 2) is the _____. |
| 2. pharynx | 8. The part labelled B (Fig. 2) is the _____. |
| 3. syrinx | 9. The part labelled C (Fig. 2) is the _____. |
| 4. larynx | |
| 5. mouth cavity | |
-
- | | |
|------------------|---|
| 1. aorta | 10. The part labelled D (Fig. 2) is a(n) _____. |
| 2. bronchus | 11. The part labelled E (Fig. 2) is a(n) _____. |
| 3. lung | 12. The part labelled F (Fig. 2) is a(n) _____. |
| 4. nasal passage | |
| 5. trachea | |

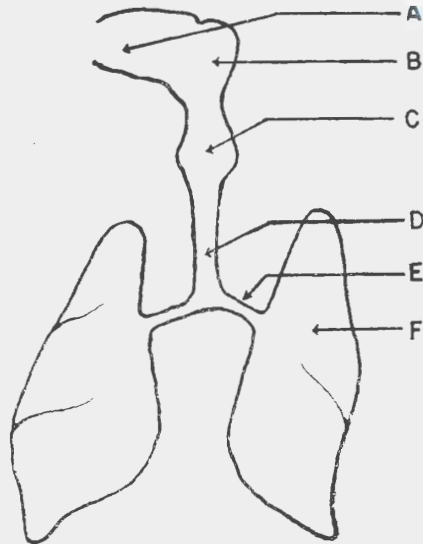


Fig. 2. Diagram of Human Respiratory Organs

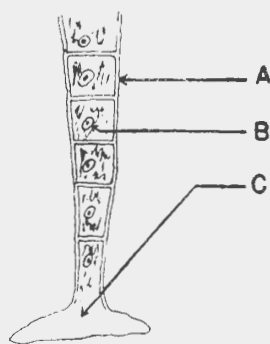


Fig. 3. Diagram of a Chloroplast

- | | |
|-----------------------|--|
| 1. holdfast | 13. The part labelled A (Fig. 3) is a _____. |
| 2. pyrenoid | 14. The part labelled B (Fig. 3) is a _____. |
| 3. nucleus | 15. The part labelled C (Fig. 3) is a _____. |
| 4. spiral chloroplast | |
| 5. cell wall | |

Directions (Items 16 through 45): Proceed as in Part I

16. Root hairs of a complex plant function to _____.
- 16-1 distribute food materials to the cells.
- 16-2 destroy wastes of protein metabolism.
- 16-3 absorb water from the soil.
- 16-4 conduct food from the stem to the roots.
- 16-5 prevent the loss of too much water. _____ 16()

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17. Observation of our surroundings and the study of geology furnish evidence that the surface of the earth
17-1 is changing today but did not change in the geological past.
17-2 is constantly changing.
17-3 changed greatly in the past but is not changing today.
17-4 does not change.
17-5 is not affected by wind and running water. 17()
18. Which statement in the following list applies to Paramecium?
18-1 It is a many-celled animal.
18-2 It is a complex plant.
18-3 It is a green plant.
18-4 It is a single-celled animal.
18-5 It is a single-celled plant. 18()
19. Rat fleas are most harmful to man because they
19-1 irritate the skin.
19-2 carry the germs of malaria.
19-3 attack domesticated animals.
19-4 transmit bubonic plague.
19-5 eat epidermal scales. 19()
20. Green algae (plants) differ from single-celled animals in that the green algae
20-1 are always larger.
20-2 are able to make foods.
20-3 live only in water.
20-4 are able to move about.
20-5 use energy only during the day-time. 20()
21. In man, amylopsin is secreted by the pancreas. It passes through a duct into the small intestine, where it aids in breaking down carbohydrates into simple sugars. It would, therefore, be classified as a(n)
21-1 hormone.
21-2 vitamin.
21-3 food.
21-4 waste.
21-5 enzyme. 21()
22. A large blood vessel out in the tissues of a frog is examined. It is found to be carrying blood that is moving toward the heart. This indicates that the vessel in question is a(n)
22-1 lymphatic.
22-2 artery.
22-3 sinus.
22-4 vein.
22-5 capillary. 22()
23. The units in chromosomes responsible for the inheritance of various unit characters are the
23-1 genes.
23-2 nuclei.
23-3 vacuoles.
23-4 asters.
23-5 nodes. 23()
24. A new species of fish is brought up from a depth of 8,000 feet in the ocean. It is evident that such a fish is able to
24-1 make its own foods.
24-2 live upon green plants.
24-3 withstand great pressure.
24-4 live without oxygen.
24-5 come up to the surface at regular intervals. 24()
25. One important function of a maple tree's leaves is to
25-1 store foods.
25-2 absorb mineral compounds.
25-3 produce seeds.
25-4 shade the ground.
25-5 make foods. 25()
26. The food-transporting tissue of a dicot stem is known as the
26-1 cortex.
26-2 stigma.
26-3 phloem.
26-4 cotyledon.
26-5 xylem. 26()
27. A certain plant contains no chlorophyll and is always found growing upon decaying plant material. We may conclude that this plant is
27-1 photosynthetic.
27-2 aquatic.
27-3 parasitic.
27-4 omnivorous.
27-5 saprophytic. 27()
28. The two substances from which green plants make foods are
28-1 water and carbon dioxide.
28-2 calcium carbonate and oxygen.
28-3 sulphur dioxide and oxygen.
28-4 oxygen and nitrogen.
28-5 water and oxygen. 28()
29. A cambium layer is found in
29-1 all higher animals.
29-2 the region of the large intestine.
29-3 mosses and liverworts.
29-4 parasitic organisms.
29-5 dicot stems. 29()
30. A green plant normally stores food in the form of
30-1 glycogen.
30-2 simple sugar.
30-3 starch.
30-4 nitrates.
30-5 cellulose. 30()
31. In a higher animal, the function of the kidneys is to
31-1 digest fatty substances.
31-2 secrete hormones.
31-3 remove liquid wastes from the blood.
31-4 develop new red corpuscles.
31-5 store excess sugar. 31()

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- 32-2 South American anteater.
32-3 codfish.
32-4 duck-billed platypus.
32-5 kangaroo. 32()
3. Two seed leaves are developed in the sprouting of a
33-1 dicot.
33-2 moss.
33-3 filamentous alga.
33-4 monocot.
33-5 fern. 33()
4. If you were to meet Dr. Thomas Hunt Morgan, it would be appropriate to say,
34-1 "Did you find any new types of fish in the polar seas?"
34-2 "When are you planning another trip to Mongolia?"
34-3 "Your discoveries of filtrable viruses have been very interesting."
34-4 "I have always been interested in your studies of heredity."
34-5 "Do you plan to continue your studies of yellow fever?" . . . 34()
35. In general, the spherical types of bacteria are called
35-1 spirilla.
35-2 cocci.
35-3 nemas.
35-4 asters.
35-5 bacilli. 35()
36. A vitamin whose presence in the diet may prevent the development of rickets in a child is
36-1 vitamin A.
36-2 vitamin B.
36-3 vitamin C.
36-4 vitamin D.
36-5 vitamin E. 36()
37. Mushrooms, "toadstools," "puffballs," rusts, and smuts are types of plants that are known as
37-1 algae.
37-2 monocots.
37-3 fungi.
37-4 lycopods.
37-5 dicots. 37()
38. Two substances which are necessary to all living things are
38-1 carbon monoxide and oxygen.
38-2 carbon monoxide and water.
38-3 sulphur and carbon monoxide.
38-4 water and oxygen.
38-5 carbon dioxide and helium. . . 38()
- 39-1 it saves time.
39-2 it is cheaper than any other method of preservation.
39-3 it permits a certain amount of bacterial decomposition to occur.
39-4 cell walls in the foods are not ruptured to any great extent.
39-5 it breaks down tough fibers in the foods. 39()
40. You tap a stem of a mimosa plant and the leaves droop. If all of the stems are tapped, it is found that all of the leaves droop. Repeated trials with many different mimosa plants show that the results are always the same. Such a reaction is a(n)
40-1 tropism.
40-2 conditioned reflex.
40-3 intelligent act.
40-4 abnormal act.
40-5 habit. 40()
41. In the following list, the organism best able to delay response to stimuli is
41-1 man.
41-2 a fish.
41-3 an earthworm.
41-4 Amoeba.
41-5 a crayfish. 41()
42. Two plants are found living together. Plant A absorbs and retains water for itself and for Plant B. Plant B makes food for itself and Plant A. Thus both plants profit from the association. This would be a case of
42-1 hibernation.
42-2 parasitism.
42-3 aestivation.
42-4 symbiosis.
42-5 tropism. 42()
43. When the intestine of a certain animal is examined, its lining is found to bear numerous finger-like projections. Such structures might be of advantage to the animal because they would
43-1 tend to speed up the passage of food.
43-2 cause the blood to clot if the surface were injured.
43-3 prevent the absorption of water.
43-4 tend to reduce the internal surface area.
43-5 increase the internal surface area. 43()

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44. In the following list, the animal which eats the greatest variety of different foods is the
- 44-1 garter snake.
 - 44-2 robin.
 - 44-3 English sparrow.
 - 44-4 pocket gopher.
 - 44-5 house rat. 44()

45. Reptiles were the dominant form of land life in the
- 45-1 Devonian period.
 - 45-2 Mesozoic era.
 - 45-3 Pennsylvanian period.
 - 45-4 Paleozoic era.
 - 45-5 Pleistocene period. 45()

Number wrong	0	3	7	11	15	19	23	27	31	35	39	43	47	51	55	59	63	67	71	75	79	83	87	91	95
	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
	2	6	10	14	18	22	26	30	34	38	42	46	50	54	58	62	66	70	74	78	82	86	90	94	+
Amount to be subtracted	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

Number right _____

Subtract _____
(See table above)

Raw Score = Difference _____

Scaled Score _____
(See table on key)

2. Oxygen has an atomic weight of (1) 2 (2) 1 (3) 3 (4) 16 (5) 35.5
3. Chemically, mercury is known by the symbol (1) Pb (2) Hg (3) Sb (4) Au (5) M
4. The earth has a diameter of approximately (1) 8000 miles (2) 50000 miles (3) 25,100 miles (4) 25,000 miles (5) 260,000 miles
5. The ampere is a unit used in measuring (1) gravitation (2) electric potential (3) resistance (4) electric currents (5) heat
6. Distance east and west around the earth is called (1) declination (2) altitude (3) inclination (4) latitude (5) longitude
7. Hydrogen usually has a valence of (1) 2 (2) 1 (3) 3 (4) 4 (5) 6
8. The geographic poles are cold because (1) the sun's rays strike obliquely (2) there are few hours of sunlight (3) large frigid masses of snow and ice hold the temperature down (4) there is more water than land (5) the altitudes are high.
9. An example of a sedimentary rock is (1) schist (2) granite (3) marble (4) obsidian (5) sandstone
10. An instrument for measuring relative humidity is a (1) thermometer (2) barometer (3) hygrometer (4) hydraulic ram (5) galvanometer
11. The one of these substances having the highest specific heat is (1) water (2) copper (3) glass (4) soil (5) rubber
12. Rays most refracted by a prism are (1) red (2) yellow (3) blue (4) green (5) violet
13. Heat travels from sun to earth by means of (1) conduction (2) convection (3) capillarity (4) radiation (5) gravitation
14. "Mercator's projection" is in the terminology of (1) mountains (2) winds (3) maps (4) magnets (5) planets
15. The latent heat of vaporization for water in calories per gram is about (1) 80 (2) 212 (3) 536 (4) 746 (5) 32
16. That period known as the age of fishes was the (1) Tertiary (2) Carboniferous (3) Quaternary (4) Archeozoic (5) Devonian
17. The colored band into which white light is broken by a prism is called a (1) fulcrum (2) latus rectum (3) quantum (4) spectrum (5) sputum
18. A temperature recorded as 100° on a Centigrade thermometer would correspond on a Fahrenheit thermometer to (1) 32° (2) 0° (3) 100° (4) 212° (5) 80°

20. Light has a velocity in miles per second of (1) 185,000 (2) 3,000,000 (3) 1100 (4) 240,000 (5) 93,000,000
21. As a speeding train approaches a warning bell, a passenger notes that the bell (1) rises in pitch (2) seems to be coming from all directions (3) drops in pitch (4) loses its bell-like quality (5) is not affected.
22. When it is mid night in Kansas City, it is one A.M. in (1) St. Louis (2) New York (3) Denver (4) Salt Lake City (5) Winnipeg
23. The foot-pound is a unit of (1) force (2) work (3) power (4) momentum (5) acceleration
24. Lines connecting points of equal barometric pressure are (1) isotherms (2) isomers (3) isobars (4) thermographs (5) barographs
25. A non-inflammable dry-cleaning fluid is (1) carbon tetrachloride (2) carbon sulfide (3) ethyl alcohol (4) silver nitrate (5) Fehling's solution
26. A test for carbon dioxide uses (1) lime water (2) silver chloride (3) sodium hydroxide (4) sal ammoniac (5) ferrous sulfate
27. The most chemically reactive constituent of air is (1) argon (2) neon (3) oxygen (4) carbon dioxide (5) nitrogen
28. One of the halogens is (1) sodium (2) bromine (3) mercury (4) silver (5) antimony
29. Pitch depends on (1) frequency (2) amplitude (3) intensity (4) source (5) velocity
30. Pitchblende is a source of (1) mercury (2) iron (3) radium (4) gold (5) aluminum
31. Light is to color as sound is to (1) intensity (2) amplitude (3) interference (4) quality (5) pitch
32. The planet closest to the sun is (1) Mars (2) Earth (3) Mercury (4) Jupiter (5) Pluto
33. Inertia is directly proportional to (1) mass (2) size (3) motion (4) shape (5) acceleration
34. A doughnut-shaped coral isle is called a (1) tundra (2) fiord (3) atoll (4) atoll (5) tor
35. When a thermometer is immersed in hot water, it first falls slightly and then rises rapidly. It falls at first because of (1) expansion of mercury (2) expansion of glass (3) contraction of mercury (4) contraction of glass (5) reduction of air pressure
36. When energy in the form of heat is transmitted from one molecule to another, the process is called (1) conduction (2) convection (3) radiation (4) transfusion (5) absorption

38. In a storage battery, the negative pole is made of (1) zinc (2) carbon (3) copper (4) lead (5) nickel
39. Combustion is synonymous with (1) boiling (2) melting (3) freezing (4) burning (5) drying
40. A gas which supports combustion is (1) nitrogen (2) hydrogen (3) oxygen (4) carbon monoxide (5) carbon dioxide
41. Substances which tend to speed up chemical reactions without being affected themselves are (1) electrolytes (2) ionogens (3) catalysts (4) allotropes (5) isotopes
42. One way to make hydrogen is by the reaction of hydrochloric acid and (1) sodium chloride (2) copper sulphate (3) sodium hydroxide (4) potassium chlorate (5) zinc
43. A meter is, in inches, about (1) 27 (2) 12 (3) 39 (4) 144 (5) 32
44. Chemical change is exemplified by the (1) dissolving of salt (2) osmosis of glucose (3) exchange of gases in the lungs (4) oxidation of sugar (5) desiccation of spores
45. Barometers measure (1) rainfall (2) humidity (3) air pressure (4) gravity (5) electricity
46. The solar system revolves around (1) the earth (2) the moon (3) Jupiter (4) Mars (5) the sun
47. Atmospheric pressure is involved in the operation of the (1) siphon (2) hydraulic press (3) thermometer (4) voltaic cell (5) telephone
48. If a weight of 1200 pounds is to be raised by means of a hydraulic press, the ratio of whose piston areas is 1:6, the force needed will be (1) 100 lbs. (2) 200 lbs. (3) 300 lbs. (4) 2400 lbs. (5) 600 lbs.
49. Electric charges are detected by means of the (1) condenser (2) dynamo (3) voltammeter (4) electroscope (5) spectroscope
50. Light which strikes a mirror at an angle of 30° is reflected at an angle of (1) 45° (2) 0° (3) 90° (4) 60° (5) 15°
51. Power companies step down high voltages by means of (1) condensers (2) dynamos (3) rheostats (4) transformers (5) interrupters
52. Bases and acids can be distinguished by means of (1) catalyzers (2) indicators (3) colloids (4) anhydrides (5) salutes
53. To raise the temperature of 10 grams of water from 15° to 16° , the number of calories of heat needed is (1) 1 (2) $1/10$ (3) 100 (4) 10 (5) 1000
54. The fraction of oxygen by volume in the air is about (1) $1/25$ (2) $1/5$ (3) $2/5$ (4) $4/5$ (5) $9/10$

56. Sound has a velocity in air of about (in feet per second) (1) 240,000 (2) 186,000 (3) 1100 (4) 980 (5) 32
57. The formula p/v equals $p \cdot v$ refers to (1) falling bodies (2) light intensities (3) radio waves (4) gas pressures (5) conservation of energy
58. Molecular attraction within a substance is called (1) magnetism (2) gravitation (3) adhesion (4) cohesion (5) capillarity
59. The watt measures (1) current (2) voltage (3) resistance (4) power (5) energy
60. A noted astronomer was (1) Copernicus (2) Harvey (3) Darwin (4) Lamarck (5) Da Vinci
61. Anticyclones are also known as (1) lows (2) highs (3) tornados (4) typhoons (5) hurricanes
62. A degree of longitude on the equator equals about (1) 70 miles (2) 45 miles (3) one nautical mile (4) 24 miles (5) 180 miles
63. Light intensity from a point source varies (1) inversely as the distance (2) inversely as the square of the distance (3) directly as the square of the distance (4) inversely as the square root of the distance (5) directly as the distance
64. Capacity is measured by a unit called the (1) ohm (2) henry (3) maxwell (4) gauss (5) farad
65. Igneous rock is exemplified by (1) marble (2) sandstone (3) granite (4) chalk (5) limestone
66. When we buy electricity, we buy (1) power (2) force (3) kilowatts (4) work (5) amperes
67. Atomic fission means (1) destruction of the nucleus (2) combination of two nuclei (3) splitting of a nucleus (4) penetration of the nucleus (5) transmutation
68. The principle of a jet plane is similar to that of (1) a swimmer kicking with his legs (2) a pusher prop (3) an air rifle (4) a rotating lawn sprinkler (5) a jack-in-the-box.
69. A gyroscope is a fundamental part of a (1) kelydroscope (2) spectroscope (3) hydrometer (4) automatic pilot (5) ferris wheel
70. Weathering in the desert is caused chiefly by (1) rain (2) wind (3) chemical reactions (4) freezing (5) meteoric bombardment
71. In the stratosphere (1) the sky is dazzlingly blue (2) there are violent winds (3) the temperature is fairly uniform (4) rocket planes cannot fly (5) the air is stratified.

through a larger angle (3) it uses ultraviolet light (4) it uses electronic bombardment (5) it uses waves shorter than light waves

73. Four of the five words are associated with the atomic bomb. The one which is not associated with the atomic bomb is (1) "Manhattan project" (2) Los Alamos (3) Pine Ridge (4) Bikini (5) Nagasaki
74. The two-hundred-inch telescope under construction will be superior to the one-hundred-inch Mt. Wilson telescope because (1) with it we can penetrate space much deeper (2) it will have twice the light gathering power (3) it will make stars look larger (4) it will greatly improve our knowledge of other planets of the solar system (5) it will have more aberration
75. Mt. Everest is not several times as high as it is because (1) it has eroded (2) there could not be enough internal pressure to force it to such heights (3) if it tended to grow to such heights, its own weight would cause it to sink (4) centrifugal force would throw such high portions into space (5) the surrounding high mountains contain all such excess material
76. The new frequency modulation (FM) radio receivers will be handicapped because (1) they will have fewer stations (2) they must be relatively close to the transmitter (3) they will be very difficult to tune (4) they will be expensive to operate (5) the first cost will be prohibitive
77. Conventional airplanes do not fly to the moon because (1) the earth's gravitation is too strong (2) we have failed to develop engines with sufficient power. (3) the wings cannot supply the tremendous lift necessary (4) the pilot could not survive the intense cold (5) the air is too thin
78. More than half the lift of the airplane is developed by (1) the propeller (2) the upper side of the wings (3) the lower side of the wings (4) the ailerons (5) the super-charger.
79. Geologically, a "bad" river is one (1) which is just a trickle (2) whose valley is steep (3) whose valley is broad and shallow (4) with many meanders (5) whose current is swift
80. Four of the five words are names of compounds. The one which is not a compound is (1) water (2) salt (3) sugar (4) air (5) baking soda
81. Four of the five words are names of planets. The one which is not a planet is (1) Jupiter (2) Pluto (3) Earth (4) Vega (5) Uranus
82. Four of the five words are names of elements. The one which is not an element is (1) iodine (2) lead (3) brass (4) tin (5) zinc
83. Four of the five words are names of scientists. The one which is not a scientist is (1) Dalton (2) Farwin (3) Galsworthy (4) Priestly (5) Archimedes
84. Four of the five words are features on the moon. The one which is not a feature on the moon is (1) mountain (2) ocean (3) crater (4) desert (5) valley
85. A "falling star" was once probably (1) a sun (2) a moon (3) a planet (4) a star (5) a small particle of matter

The moon revolves about the earth in approximately 28 days.

The moon rotates on its axis once in approximately 28 days.

Round depressions with raised edges, called craters, are very common on the surface of the moon.

Gravitation on the moon is about one-sixth as strong as gravitation on the earth.

The axis of the moon is approximately parallel to the axis of the earth.

The distance from the earth to the sun is more than 360 times the distance from the earth to the moon.

The moon has no atmosphere.

In answering questions 86--100, consider carefully the above data.

If, solely as a result of the facts stated in the data, a statement appears true, place a check in the first column, No. 1, on the answer sheet.

If, solely as a result of the facts stated in the data, a statement appears false, place a check in the second column, No. 2, on the answer sheet.

If a statement has no bearing on any of the given data, place a check in the third column, No. 3, on the answer sheet.

86. The sun appears smaller from the moon than from the earth.

87. The moon is considerably less dense than the earth.

88. The moon's year coincides with the earth's year.

89. The craters on the moon are the result of meteoric bombardment.

90. Heavy frosts occur on the moon at night.

91. A man could jump twenty feet high on the moon with little effort

92. The earth presents the same side to the moon at all times.

93. We have photographic maps of nearly all of the moon's surface.

94. Violent dust storms occur frequently on the moon.

95. The daytime sky on the moon is black and brilliantly studded with stars.

96. A day on the moon is twenty-four hours long.

97. Valuable mineral deposits lie near the surface of the moon.

98. The "man in the moon" is due to irregularity in surface features.

99. Noon temperatures on the moon are much higher than on the earth.

100. The earth hangs stationary in the moon's sky.

Instructions to the student: Select the best answer, for usually two or more answers are nearer being correct. Read each statement carefully before answering. Notice the terms used as many of the questions are to test your comprehension of the exact meaning of terms. It's not expected that a large number of students will answer correctly most of the questions. Your score will be assigned upon a comparative basis, so it is to your advantage to answer correctly as many statements as possible.

1. Imperialism before World War I was promoted by means of: (1) the League of Nations, (2) plebiscite, (3) duchy, (4) protectorate, (5) moratorium.
2. World revolution was planned by the organization of: (1) the National Convention, (2) the Frankfort Assembly, (3) the Committee of Public Safety, (4) the Third International, (5) the Third Reich.
3. A system of colonial government first established by the Treaty of Versailles after World War I was the: (1) Directory, (2) Limited monarchy, (3) Mandate, (4) Protectorate, (5) Commonwealth.
4. The laissez-faire theory of government is encouraged most by: (1) fascism, (2) paternalism, (3) rugged individualism, (4) syndicalism (5) communism.
5. The nation which changed from a feudal society to a modern industrial state about 1870 was: (1) Germany, (2) Japan, (3) Italy, (4) England, (5) United States.
6. The main characteristic of the English Cabinet governments is that it is: (1) elected directly by the people, (2) directly responsible to the legislative body, (3) selected for a definite term of office, (4) appointed by the king.
7. Russia argues that "Capitalistic Nations" like the United States tries to: (1) foster internationalism, (2) tends to concentrate power in the hands of the wealthy, (3) brings government into business, (4) prevents a working man from attaining economic independence.
8. The Russian Soviet government has been handicapped in foreign relations because of Russia's: (1) Failure to join the United Nations, (2) refusal to reduce armaments, (3) alliance with Japan, (4) interest in promoting world revolution.
9. An important factor in the development of the modern national state was the (1) increased ability of the people to read and write a common language (2) influence of the Holy Roman Empire, (3) unifying influence of the church, (4) rise of feudalism.
10. Perhaps the most important result of the British Revolution of 1688 was that it: (1) gave England a written constitution, (2) established the supremacy of Parliament over the king, (3) gave parliament an opportunity to draw up the Petition of Rights, (4) enabled the Tories party to control the government during the next fifty years.
11. Italy's main problem after 1860 was: (1) over-production of manufactured products, (2) danger of Austrian invasion in order to liberate the Pope, (3) rebellion in Italian colonial possessions, (4) hostility between church and state.

22. Germany's ability to pay for damages caused in World War I was most hampered by: (1) decreased tourist travel in Germany, (2) the refusal of loans from American and English bankers, (3) high protective tariffs in other countries, (4) the loss of her colonies.
23. Bismarck's foreign policy was completely shattered when: (1) the Congress of Berlin, in 1878, acted to restore the European balance of power, (2) construction of the Berlin-Bagdad Railway was undertaken, (3) Italy was permitted to form an alliance with Austria and Germany, (4) Russia and France signed the secret military alliance of 1894.
24. Advocates of mercantilism believed that: (1) manufacturers would be stronger if unprotected by privileges, (2) strong business would develop without use of government aid, (3) internal manufacturing would make colonies unnecessary, (4) the total amount of world trade would not be increased by home manufacturers.
25. John Locke, in justifying the English Revolution of 1688, asserted that: (1) the natural liberty of man is to do as one pleases, (2) natural liberty exists only in the absence of government, (3) natural liberty exists only in government by consent, (4) natural liberty exists only in freedom from social restraint.
26. In his theory of the "social contract", written before the French Revolution, Rousseau asserted that: (1) the State, the Sovereign, and the Power are all expressions of the same thing, (2) the individual must surrender part of his political rights to the State without compensation, (3) the individual gains no additional power from the organization of the State, (4) that the State creates new sovereign power by the common action of society.
27. Adam Smith's attitude toward high tariffs would be that: (1) they are advantageous because they aid home industries, (2) they are unwise because they encourage inefficient industries, (3) they are desirable because they increase the number of home industries, (4) they are desirable because they promote unnatural home industries which strengthen the State.
28. One "inalienable right" which is not found in both the Declaration of Independence and the French "Declaration of the Rights of Man" is: (1) Life, (2) Liberty, (3) Property, (4) Resistance to oppression.
29. The one person listed below whose ideas on social progress and organization conforms least with the others is: (1) Herbert Hoover (2) Adam Smith (3) Charles Darwin (4) Karl Marx.
30. David Ricardo, the economist, would most probably advocate the high wage policies of: (1) Henry Ford, (2) Phillip Murray, (3) Franklin D. Roosevelt, (4) Sewell Avery, (5) Ernest Bevin.
31. The assertion that the struggles of the working classes to raise their standards justifies inevitable revolution is stated in: (1) Declaration of Independence, (2) The Fundamental Rights of German people, (3) The Communist Manifesto (4) Declaration of the Rights of Man, (5) The Atlantic Charter.

32. The Monroe Doctrine was proclaimed in 1823 to prevent: (1) Russian annexation of Alaska, (2) the European powers from aiding Spain to recover her colonies, (3) Great Britain from seizing Venezuela, (4) the Holy Alliance attacking Florida.
33. One of the most important factors which promoted expansion of the British Empire in the 19th Century was: (1) Gladstone's policy of exploiting backward people, (2) Civil and religious oppression which forced British subjects to leave the British Isles, (3) the impetus to trade resulting from the Industrial Revolution, (4) the consistently imperialistic policy of the British Government.
34. The least significant factor accounting for the colonial expansion in the last century was: (1) growth of manufacturing, (2) religious motives, (3) source for raw materials, (4) place to invest a surplus capital.
35. Under the American constitution one of the following is not considered a civil right of all citizens: (1) freedom of religion, (2) freedom of speech, (3) voting, (4) right of peaceful assembly.
36. Italy, Germany, and Japan wanted to become self-sufficient mainly so as to: (1) improve the standard of living of the masses, (2) protect domestic industry and agriculture, (3) increase foreign trade, (4) to strengthen the nation's military power.
37. Industry under German Fascism: (1) was closely regulated by the government, (2) was owned and operated by the government, (3) was almost completely unrestricted, (4) was owned and operated by the workers.
38. The Munich Conference of 1933 (1) enabled Czechoslovakia to negotiate directly with Germany, (2) decided the fate of Czechoslovakia without the latter being represented, (3) enabled President Roosevelt to mediate the Sudeten crisis, (4) gave Russia a chance to influence the settlement.
39. One of the following is not a self-governing Dominion of the British Empire: (1) Canada, (2) Egypt, (3) Australia, (4) Union of South Africa, (5) New Zealand.
40. Reciprocal trade agreements made by Cordell Hull were ones in which: (1) mutual concessions were made, (2) Money was promised in return for goods, (3) rights were granted in return for taxes or tribute, (4) we granted privileges to only weaker nations, (5) all tariffs of the two countries were abolished.

MODERN CIVILIZATION

1. A device often used by strong nations to exert an imperialistic control over weaker nations is the: (1) League of Nations, (2) plebiscite, (3) duchy, (4) protectorate, (5) moratorium.
2. Organized to accelerate world revolution: (1) National Convention, (2) Frankfort Assembly, (3) Committee of Public Safety, (4) Third International, (5) Third Reich.
3. A system of colonial government first established by the Treaty of Versailles: (1) Directory, (2) Limited monarchy (3) Mandate, (4) Protectorate, (5) Commonwealth.
4. The laissez-faire theory of government has most resemblance to: (1) fascism, (2) paternalism, (3) rugged individualism, (4) syndicalism, (5) communism.
5. Which one of the following nations changed from a feudal society to a modern industrial state in the shortest period of time? (1) Germany, (2) Japan, (3) Italy, (4) England, (5) United States.
6. The essential characteristic of the cabinet as developed in parliamentary governments is that it is: (1) elected directly by the people, (2) directly responsible to the legislative body, (3) selected for a definite term of office, (4) appointed by the king.
7. Socialism opposes the present economic system because the latter: (1) fosters internationalism, (2) tends to concentrate power in the hands of the wealth, (3) brings government into business, (4) prevents a working man from attaining economic independence.
8. The Russian Soviet government has been handicapped in foreign relations because of Russia's: (1) Failure to join the League of Nations, (2) refusal to reduce armaments, (3) alliance with Japan, (4) interest in promoting world revolution.
9. An important factor in the development of the modern national state was the: (1) increased ability of the people to read and write the vernacular, (2) influence of the Holy Roman Empire, (3) unifying influence of the church, (4) rise of feudalism.
10. Perhaps the most important result of the British Revolution of 1688 was that it: (1) gave England a written constitution, (2) established the supremacy of Parliament over the king, (3) gave Parliament an opportunity to draw up the Petition of Right, (4) enabled the Tories to control the government during the next fifty years.

11. One of the problems challenging Italy immediately after its unification was the: (1) over-production of manufactured products, (2) danger of Austrian invasion in order to liberate the pope, (3) rebellion in Italian colonial possessions, (4) hostility between church and state.
12. The Commercial Revolution of the seventeenth century paved the way for the Industrial Revolution by: (1) increasing the knowledge concerning industrial methods in foreign lands, (2) first opening the trade with India, (3) increasing demands for products of agriculture, (4) greatly increasing available capital.
13. The exploitation of colonies is of chief benefit to the men who: (1) have surplus capital to invest, (2) produce raw materials at home, (3) do manual labor in factories, (4) have minor civil service positions.
14. England and France, after having been enemies for centuries, became allies early in the twentieth century chiefly because of: (1) their common fear of Germany, (2) their economic interdependence, (3) the growing power of Russia in European affairs, (4) better acquaintance brought about by increased ease of communication.
15. The Boxer Rebellion in China: (1) overthrew the Manchu dynasty, (2) expressed the resentment of the people against the coming of the Europeans, (3) was an attempt to throw off Japanese territorial domination, (4) was a protest against the corruption of the Chinese government.
16. An important result of the Russo-Japanese War was that it: (1) brought about the Russian Revolution of 1917; (2) brought about extensive reforms within Japan by exposing the corruption in the government, (3) checked Russian expansion in Asia, (4) led to the restoration of Korea to China.
17. The most reasonable conclusion about the question of World War (1914-1918) guilt is that: (1) the whole system of secret diplomacy, alliances, treaties, and economic rivalries was to blame, (2) the political unrest and nationalistic rivalry in the Balkans made war inevitable, (3) the offensive alliance between France and Russia was the fundamental cause of the war, (4) Germany and Austria were almost entirely responsible.
18. The chief object of Russia's Five-Year Plan was: (1) a great increase in industrial and agricultural production, (2) the spread of Bolshevik propaganda throughout the working classes of the democracies, (3) the suppression of religion, (4) the inclusion of ninety per cent of the people in the Communist party.

19. The general trend of tariffs after the World War of 1914-1918 was toward higher duties. The chief reason for this was a: (1) desire in each country to increase its tariff revenue, (2) need for low priced manufactured goods, (3) belief that free trade led to the World War, (4) strong feeling that home markets should be reserved for home industries.
20. There has been much disorder in Palestine in recent years because of: (1) labor troubles encouraged by Communist propaganda, (2) British suppression of the Mohammedan religion, (3) Russian propaganda, (4) Arab resentment of the Jewish immigration.
21. Which one of the following has been most important in causing nations to become concerned with one another's problems? (1) immigration of large numbers of people from one country to another, (2) "International-mindedness" of the working classes, (3) improvements in communication and transportation, (4) general acceptance of the idea of an association of nations.
22. German's ability to pay reparations was most hampered by: (1) decreased tourist travel in Germany, (2) the refusal of loans from American and English bankers, (3) high protective tariffs in other countries, (4) the loss of her colonies.
23. Bismark's foreign policy was completely shattered when: (1) the Congress of Berlin acted to restore the European balance of power, (2) construction of the Berlin-Bagdad Railway was undertaken, (3) Italy was permitted to form an alliance with Austria and Germany, (4) Russia and France signed the secret military alliance of 1894.
24. Colbert, as a strong advocate of mercantilism, believed that: (1) manufacturers would be stronger if unprotected by privileges, (2) strong business would develop without use of subsidies, (3) internal manufacturing would make colonies unnecessary, (4) the total amount of world trade would be little affected by home manufactures.
25. John Locke in his theories of "Natural rights" asserted that: (1) The natural liberty of man is to do as one pleases, (2) natural liberty exists only in government by consent, (4) natural liberty exists only in freedom from social restraint.
26. In his theory of the "social contract", Rousseau asserted that: (1) The State, the Sovereign, and the Power are all expressions of the same thing, (2) the individual must surrender part of his political rights to the State without compensation, (3) the individual gains no additional power from the organization of the state, (4) that the State creates new sovereign power by the common action of society.

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33. One of the most important factors which contributed to the expansion of the British Empire in the 19th Century was: (1) Gladstone's policy of exploiting backward people, (2) Civil and religious oppression which forced British subjects to leave the British Isles, (3) the impetus to trade resulting from the Industrial Revolution, (4) the consistently imperialistic policy of the British Government.
35. Under the American constitution one of the following is not considered a civil right of all citizens: (1) freedom of religion, (2) freedom of speech, (3) voting, (4) right of peaceful assembly.
36. Industry under Fascism: (1) is closely regulated by the government, (2) is owned and operated by the government, (3) is almost completely unrestricted, (4) is owned and operated by the workers.

37. The chief purpose of the drive for economic self-sufficiency is: (1) to improve the standard of living of the masses, (2) to protect domestic industry and agriculture, (3) to increase foreign trade, (4) to strengthen the nation's military power.
38. The Munich Conference of 1938 (1) enable Czechoslovakia to negotiate directly with Germany, (2) decided the fate of Czechoslovakia without the latter being directly represented, (3) enabled President Roosevelt to mediate the Sudeten crisis, (4) gave Russia a chance to influence the settlement.
39. One of the following is not a self-governing dominion of the British Empire: (1) Canada, (2) Egypt, (3) Australia, (4) Union of South Africa, (5) New Zealand.
40. A reciprocal agreement is one in which: (1) mutual concessions are made, (2) money is promised in return for goods, (3) rights are granted in return for taxes or tribute, (4) a strong power grants privileges to a lesser power, (5) all tariffs applicable to the two countries are abolished.

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